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DE LA

SOCIÉTÉ ROYALE

DU

CANADA

SECONDE SÉRIE—TOME I

SÉANCE DE MAI 1895

EN VENTE CHEZ
JOHN DURIE ET FILS, OTTAWA ; LA CIE COPP-CLARK, TORONTO ;
BERNARD QUARITCH, LONDRES, ANGLETERRE
1895

PROCEEDINGS

AND

TRANSACTIONS

OF THE

ROYAL SOCIETY

OF

CANADA

SECOND SERIES—VOLUME I

MEETING OF MAY, 1895

FOR SALE BY
JOHN DURIE & SON, OTTAWA; THE COPP-CLARK CO., TORONTO
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1895

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ERRATA.

In Mr. Macfarlane's paper, Section III.:

Page 19. Second line from bottom, for "asbestus" read "*Asboths.*"

" 20. Third line above "statement" for "Willstein" read "*Wittstein.*"

In Sir William Dawson's paper, Section IV.:

Page 147. For Fig. 10 read Fig. 12.

" 147. For Fig. 12 read Fig. 10.

" 153, Plate IV. Figs. 5 and 6 are enlarged.

" 155, Plate V. The engraver has concealed the venation with cross-hatching.

ROYAL SOCIETY OF CANADA.

PROCEEDINGS FOR 1895.

FOURTEENTH GENERAL MEETING.

SESSION I. (May 15th.)

The Royal Society of Canada held its fourteenth general meeting in the Assembly Hall of the Normal School, at Ottawa, on Wednesday, May 18th. The President, James M. LeMoine, Esquire, took the chair at 10 o'clock, and formally called the meeting to order.

The Honorary Secretary, Dr. J. G. Bourinot, C.M.G., read the roll of members, and the following gentlemen answered to their names :

LIST OF MEMBERS PRESENT.

President, James M. LeMoine.

Vice-President, Dr. Selwyn.

Honorary Secretary, Dr. Bourinot.

Honorary Treasurer, Mr. J. Fletcher.

SECTION I.—A. D. DeCelles, Abbé Gosselin, J. M. LeMoine, F. G. Marchand, A. Poisson, J. E. Roy, J. Royal, B. Sulte, Mgr. Tanguay.

SECTION II.—J. G. Bourinot, D. Brymner, Rev. J. Campbell, W. W. Campbell, Rev. W. Clark, S. E. Dawson, Very Rev. G. M. Grant, W. Kingsford, J. A. MacCabe, G. Murray, Rev. J. Clark Murray, Archbishop O'Brien, Rev. G. Patterson, G. Stewart, J. Watson.

SECTION III.—H. T. Bovey, Abbé de Foville, E. Deville, N. F. Dupuis, W. H. Ellis, S. Fleming, G. P. Girdwood, W. L. Goodwin, Mgr. Hamel, B. J. Harrington, G. C. Hoffmann, A. Johnson, T. C. Keefer, T. Macfarlane, J. G. McGregor, C. H. McLeod.

SECTION IV.—R. Bell, T. J. W. Burgess, G. M. Dawson, Sir J. W. Dawson, R. W. Ells, J. Fletcher, J. Fowler, Sir J. A. Grant, W. H. Harrington, J. Macoun, G. F. Matthew, T. W. Mills, D. P. Penhallow, W. Saunders, A. R. C. Selwyn, J. F. Whiteaves.

M. Adolphe Poisson and Professor de Foville, new members, were formally introduced.

The Honorary Secretary then read the following

REPORT OF COUNCIL.

The council of the Royal Society of Canada have the honour to present their thirteenth annual report.

The council have received the following report from Dr. Bourinot on behalf of the committee on printing, and recommend that the society should carefully consider its several suggestions with respect to the future printing and circulation of the Transactions :

1. Report of the Printing Committee.

"The printing committee have the honour to report to the council that the twelfth volume of the Transactions is now in the binder's hands, and will in a few days be ready for distribution among members and all others entitled to receive it. The volume is the largest and, in some respects, the most interesting that has yet appeared since the publication of the Transactions.

"The two largest volumes of the Transactions that have yet appeared had the following amount of matter :

	Vol. I.	Vol. VIII.
Proceedings	72 pp.	84 pp.
Section I.	165 "	114 "
" II.	96 "	343 "
" III.	100 "	61 "
" IV.	286 "	128 "
Total	729 pp.	730 pp.
	18 plates and cuts.	12 maps and 54 plates, cuts and maps.

Vol. XII. contains :

Proceedings	80 pp.
Bibliography	80 "
Section I.	200 "
" II.	182 "
" III.	50 "
" IV.	152 "
General Index	14 "
Total	758 pp.

50 maps, cuts and plates.

"Consequently the twelfth volume contains thirty more pages than the two largest previously published in ten years.

"A few papers have been unavoidably deferred for a short time, on account of the supply of special paper required for the Transactions having been exhausted by the unusual size of the present volume. Authors, however, will learn with satisfaction that the printing of their papers will be hurried as soon as the society comes to a conclusion as to the form the new series should take—octavo or quarto. In fact, they will receive their papers in pamphlet form in a few weeks after the distribution of the new volume.

"In calling attention to the desirability of changing the present cumbrous and expensive form of Transactions to a more manageable and cheaper octavo volume, the printing committee is strengthened by the fact that the Royal Society of London has already taken the initiative in the same direction. The reasons adduced for the proposed change apply with equal force to the Canadian society.

"The secretaries, Lord Rayleigh and Professor Foster, tell us: 'The majority of the council are inclined to regard the quarto form as cumbrous, and to think that a large octavo form is more convenient for reading and for general use. A royal octavo page (10 inches by $6\frac{1}{4}$ inches), unbound, or imperial octavo page ($11\frac{1}{4}$ inches by $7\frac{1}{2}$ inches), would contain about as much press matter as the present quarto page, in an equally readable and very similar type, and would be adequate for at least most mathematical formulæ; some formulæ are too long for even the present quarto page. Such a page would, moreover, be much more economical for the majority of illustrations, and where a larger area was needed this might be supplied by a folding plate with a guard.'

"The printing committee, after giving full consideration to the whole subject, conclude that the following advantages will be derived from a change of form:

"1. That it will be more convenient for readers, who find it almost impossible to use the present cumbrous volume for purposes of study with any degree of comfort, especially when it is as large as the one just printed for 1894.

"2. That authors will be able to get their essays and monographs before the public in a more popular and convenient form, and feel encouraged in especial cases to issue editions of their work for sale throughout the Dominion and elsewhere, and in this way reach the people generally.

"3. That by dividing the Transactions into two or more separate volumes it will be possible to transmit a number to foreign societies and libraries by mail, and save a considerable expense that arises in the distribution by the ordinary business channels now only available in the case of such heavy volumes.

"4. That it is possible to obtain a class of durable paper for scientific illustrations and maps that can be satisfactorily folded in an octavo volume.

"5. That by the use of thinner and cheaper paper, suitable for such a royal octavo form as is now proposed, the cost of the publications of the Royal Society will be lessened, and more opportunity given for the printing of papers which, if the present and expensive form is continued, must be necessarily held over from year to year.

"6. That, in short, economy, convenience and publicity will be the direct results of the proposed change.

"In previous years the printing committee have called attention to the numerous corrections, alterations and additions that have been made by authors to the proofs of their papers, and the consequent increase of the cost of printing the Transactions. Since the establishment of the society at least three thousand dollars have been added in this way to the aggregate of expenses. It is a rule that authors should bear a proportion of such expenses, and were it possible to collect the amount now due to the society in this way, its expenses would be considerably diminished. In drawing attention again to the matter, the printing committee wish to point out the absolute necessity there exists for type-written, or at all events legibly written, manuscript in all cases. The Smithsonian Institution and National Museum at Washington, after years of trouble and expense from the same cause—and it is well to remember they are well supplied with funds,—have been forced to require authors, as far as practicable, to submit manuscripts in type-written form revised by themselves, and in some cases, adds Mr. A. Howard Clark in a letter to the honorary secretary, 'we have returned the manuscript to be more carefully prepared for the printer.' The printing committee must adopt a similar rule for the future.

"At the present time there are awaiting publication several essays so illegibly and carelessly written that it is only possible to print them at a large cost, which the society cannot well afford. The printing committee also call attention to the rule, which will be rigidly adhered to in the future, that all manuscript must be sent to the honorary secretary and editor, Dr. Bourinot, by the 1st of August at latest. These rules are clearly in the interest of the authors and society at large.

"The accounts for printing will be audited, as in past years, by the accountant of the government printing bureau. All the illustrations have been in charge of the queen's printer, who has made contracts with those engravers who can best perform the work with economy and efficiency. Consequently this expensive portion of the Transactions has been at less rates than in previous years."

2. Accounts.

The following are the accounts to date, 14th May:

Publishing Accounts.

Montreal, May 15, 1895.

Royal Society of Canada,

To Gazette Printing Co., *Dr.*

1894.		
May 21	—To balance due on vol xi	$ 494 08
July 30	— " 4 line cuts, Prof. Bovey's paper	5 00
Nov. 17	—Add. publications of Society	9 90
1895.		
Feb. 26	—Engraving, Matthew's paper	21 50
March 30	—120 copies title-page	5 00
	1,440 copies R. S. C. Proceedings, 1894:	
	Composition	1,390 99
	Alterations and corrections	283 80
	Paper	1,137 60
	Presswork	321 00
	Paper and plates, Penhallow's paper	40 00
	Proof-reading, editorial services, miscellaneous	360 00
		$4,068 87
1895.	*Cr.*	
May 15	—By cash paid Gazette Co., as per statement below	2,600 00
	Balance due Gazette Co. on May 15, 1895	$1,468 87

Montreal, Feb. 13, 1895.

Royal Society of Canada.

To Manufacturers' Stationers Co. (Dawson Bros.), Montreal.

Dr.

1894	—To balance due on last account	$ 367 90
	" Cases, shipping expenses	71 75
	" Foreign and domestic freight charges	294 99
	" Authors' copies, doing up and expenses	72 64
	" Binding	535 59
	" Insurance, storage, etc	82 80
	" Printing receipts and postage	11 00
		$1.436 67

Cr.

1894	—By cash as per statement below	$1,320 00
	" Copies sold	12 50
		1,332 50
	Balance due Dawson Bros. May 14 on foregoing account	$ 104 17

General Financial Statement of Royal Society from May 21, 1894, *to May* 14, 1895.

Dr.

To cash on hand (Hon. Secretary) May 21, 1894	$ 108 21
" Government grant for 1894-5	5,000 00
	$5,108 21

Cr.

1894.		
Sept. 18	—To Gazette Co.	$1,100 00
" 18	— " Man. Stationers' Co.	750 00
" 18	— " Gazette Co.	800 00
Nov. 29	— " Bank Note Co	21 75
Dec. 11	— " A. Fréchette	25 00
" 11	— " S. T. Ami	25 00
" 11	— " Toronto Engraving Co	38 00
" 11	— " Can. Photo. Engraving Bureau	24 00
" 11	— " Sabiston Lithographing Co	59 20
" 11	— " S. E. Dawson	7 85
1895.		
Jan. 28	— " S. T. Ami	25 00
March 16	— " Gazette Co	700 00
" 16	— " Dawson Bros	570 00
April 30	— " W. C. Bowles	60 00
	Cash in hands of Honorary Secretary to May 14, 1895	902 41
		$5,108 21

Amount of subscriptions in Treasurer's hands to May 14, 1895...$ 321 35

3. Popular Lectures and Readings.

The meeting of the Royal Society on the 15th of May will present a novel feature, of which the literary men and women of Canada will hear with much interest. It has been the practice, for three or four years past, to combine popular lectures with the reading of the more technical and abstruse papers in the four sections of literature and science into which the whole society is divided. For instance, last year there was a very valuable address given on the subject of Forestry, by Professor Fernow, of Washington, and at the forthcoming meeting there will be one on Electricity, by Professor Cox, of McGill University. The object is to give an opportunity to that large body of the public who are not versed in science to be informed on subjects of immediately practical and current interest. At this meeting it is proposed to go a step further and

have a Poets' evening. The poets of Canada, whether in or out of the society, have been invited to come to Ottawa and take part in a literary symposium. Every poet who can attend will present an original contribution, and those who cannot be present will have a poem read by another. Miss Machar ("Fidelis"), Miss Ethelwyn Wetherald, Archibald Lampman, William Wilfred Campbell, Duncan Campbell Scott, Frederick George Scott, Bliss Carman, Archbishop O'Brien, N. F. Davin, J. D. Edgar, Charles Roberts, John Reade, S. Frances Harrison ("Seranus") and E. Pauline Johnson will be either present in person or in poems. The president of the section of English literature, Professor Clark, of Trinity University, will preside and deliver short addresses by way of preface to a most interesting event in the annals of our youthful literature. Next year it is intended to have a similar assemblage of prose writers. It is also hoped that the French Canadian poets will at the same time follow the example of their English compeers and arrange a similar evening.

4. A Design for a Seal.

For some time past it has been the desire of a number of the members of the Royal Society to obtain a design for a seal which would illustrate appropriately the objects which that body has in view. It was thought best to refer the matter to the founder of the society, the Marquess of Lorne, who has suggested an emblematic design. The sketch represents a young man carrying under one arm a roll of manuscript, and extending the torch of knowledge, with the motto above, "Onward." If the design meets with the approval of the society, it is proposed that it be submitted to a competent English engraver, for the future purposes of the society, with the addition of the words "Royal Society of Canada, founded 1882," surrounding the design as described above.

5. Vacancies in the Society.

At the present time there are the following vacancies to be filled in the society:

In the first section, two vacancies, caused by the deaths of Joseph Tassé and Joseph Marmette. The members have also the right to elect an additional member under the rules.

In the second section, one vacancy, caused by the death of the Rev. Dr. Dawson.

In the third section there are only twenty members. Professor Callender, of McGill University, has received the number of votes requisite to elect him as an additional member. But a vacancy has also occurred by the death of Mr. Carpmael.

Section four has the full complement of twenty-five permitted by the rules.

The council of the Royal Society feel it necessary to prevent some misconception that appears to exist, in and out of the society, as to the conditions of membership, and to call special attention to the provision of the constitution, which explicitly sets forth that the "Fellows shall be persons resident in the Dominion of Canada or in Newfoundland who have published original works or memoirs of merit, or have rendered eminent services to literature or science."

6. Associated Societies.

We are glad to announce that favourable answers have been received from the various scientific, literary and historical societies who have been again asked, in accordance with our constitution, to appoint delegates to this meeting, and report on the work done during the past year by their respective associations. We are happy to hear of the representation of the "Lundy's Lane" Historical Society, which has been doing good work in its special district, and affording an excellent example to other localities where similar bodies might well be established.

An invitation was also extended to the venerable scholar and antiquarian, the Rev. Dr. Scadding, of Toronto, to be present at this meeting on behalf of the Pioneer and Historical Association of Ontario, but we regret to say that his great age and failing sight have prevented his attendance, though he writes in full sympathy with the objects which the Royal Society has in view in associating itself with all the other bodies engaged in scientific or historical work throughout the Dominion.

It is also with much interest that the society has heard of the effort that is now being made at Calgary, New Westminster and other places in the Northwest Territories and in British Columbia to establish botanical clubs for the study of the varied and interesting flora that are to be found in those countries, and we hope ere long they will feel able to send delegates and reports to our meetings.

While noting activity in the formation of new societies throughout Canada, the council regret to find that several of the old associations, like the Literary and Historical Society of Quebec and the Institut Canadien, appear hampered for want of funds, and have not made reports during the present session of the Royal Society. The value of the reports published year by year in the Transactions of the Royal Society necessarily loses by the failure of their continuity.

The following is a list of the societies now associated in our work:

Society.	Place.	Delegate.
Natural History Society	Montreal	Mr. Justice Würtele.
Numismatic and Antiquarian Society	do	Rouër Roy, Q.C.
Microscopical Society	do	Dr. Girdwood.
Société Historique	do	Abbé Verreau.
Cercle Littéraire et Musical de Montréal	do	Prof. D. Coussirat, D.D.
Literary and Historical Society	Quebec	Not represented.
Geographical Society	do	Not represented.
Institut Canadien	do	Not represented.
Literary and Scientific Society	Ottawa	Mr. Otto Klotz.
Field-Naturalists' Club	do	F. T. Shutt, M.A.
L'Institut Canadien-Français	do	Not represented.
Hamilton Association	Hamilton	H. B. Small.
Entomological Society of Ontario	London	Rev. T. W. Fyles.
Canadian Institute	Toronto	O. A. Howland, M.A,
Natural History Society of N. B.	St. John	S. W. Kain.
N. S. Institute of Natural Science	Halifax	Dr. S. Fleming.
Historical Society of Nova Scotia	do	Hon. J. W. Longley.
Natural History Society of B. C	Victoria, B.C.	Not represented.
Wentworth Pioneer and Historical Society	Hamilton, Ont.	Senator McInnes.
Elgin Historical and Scientific Institute	St. Thomas, Ont.	G. E. Casey, M.P.
Historical Society of Manitoba	Winnipeg	Not represented.
Botanical Club of Canada	Halifax, N.S.	Not represented.
American Folk-lore Society	Montreal	Prof. Penhallow.
Historical Society	Kingston	Prof. Nichol.
Astronomical and Physical Society	Toronto	G. E. Lumsden.
Lundy's Lane Historical Society	Niagara Falls South.	Capt. E. Cruikshank or Rev. Canon Bull.
New Brunswick Historical Society	St. John, N.B.	J. D. Hazen, M.P.
Pioneer and Historical Association of Ontario	Toronto	Dr. Scadding.

7. New Corresponding Members.

The honorary secretary has received the following letters of acceptance from the two learned gentlemen who were unanimously elected

corresponding members of the Royal Society of Canada at the last general meeting :

"BOARD OF TRADE,

"Whitehall Gardens, S.W., 9th June, 1894.

"SIR,—I beg to acknowledge the receipt of your letter of the 25th ultimo, in which you inform me that I have been elected a corresponding member of the Royal Society of Canada. I shall be glad if you will kindly convey to the society my very sincere thanks and my sense of the high honour they have conferred upon me—an honour which I appreciate the more by the knowledge that I take the place of so esteemed a friend and so eminent a historian as the late Francis Parkman. Believe me, with renewed thanks to the society,

"Yours very faithfully,

"J. BRYCE.

"Dr. J. G. Bourinot, C.M.G."

"COLONIAL MUSEUM OF NEW ZEALAND,

"Wellington, 30th July, 1894.

"DEAR SIR,—I beg that you will convey my thanks to the Royal Society of Canada for the great honour they have conferred in electing me a corresponding member, a distinction which I very highly value, some of my earliest geological work having been for the service of the Dominion.

"I remain, dear sir,

"Yours faithfully,

"JAMES HECTOR.

"Dr. J. G. Bourinot, C.M.G., Royal Society, Ottawa, Canada."

8. THE ROYAL WILLIAM.

In accordance with the resolution adopted at the last meeting of the Royal Society of Canada, the honorary secretary communicated to his Excellency the Governor-General the wish of the various societies interested, that he should place the brass tablet which had been ordered by parliament in commemoration of the memorable voyage of the "Royal William" across the ocean in 1833. The first meeting of the intercolonial conference on June 28 was considered a most auspicious occasion for bearing public testimony to so interesting an episode in Canadian history.

The particulars of the ceremony are given below in full, as they appear in the official report of the proceedings of the conference :

"THE FIRST ATLANTIC STEAMER.

"Lord Aberdeen—I have received the following letter from the clerk of the House of Commons, and beg to read it to you :

"'*To His Excellency the Governor-General.*

"'MY LORD,—The two Houses of the Canadian Parliament have ordered that a brass tablet should be placed in the wall of the corridor leading to the library of parliament, with a suitable inscription, commemorating the departure of the 'Royal William' from the port of Quebec in 1833—the first vessel to cross the ocean wholly by means of steam.

"'Your Excellency is already familiar with the leading circumstances connected with this interesting historical fact. The brass plate ordered by parliament is now ready to be put in place, and it is felt that no more fitting time could be chosen than at the close of the opening meeting of the colonial conference.

"'On behalf of the Royal Society and associated societies, who were the first to move in doing honour to the builders and navigators of the 'Royal William,' I express the hope that your Excellency will be pleased to place the commemoration plate in its permanent position. If it is agreeable to your Excellency, I inclose the list of gentlemen who, it is thought desirable, should witness the proceedings.

"'1, The delegates to the conference ; 2, the speakers of the Senate and the Commons ; 3, Cabinet ministers ; 4, Mr. Gustavus Wicksteed, who saw the 'Royal William' launched sixty-three years ago and took passage on her trial trip ; 5, Mr. Horace Wicksteed, who boarded the 'Royal William' on her arrival in England and dined with the captain ; 6, representatives of the Royal Society and associated societies.

"'I have the honour to be your Excellency's most faithful servant,

"'J. G. BOURINOT.'

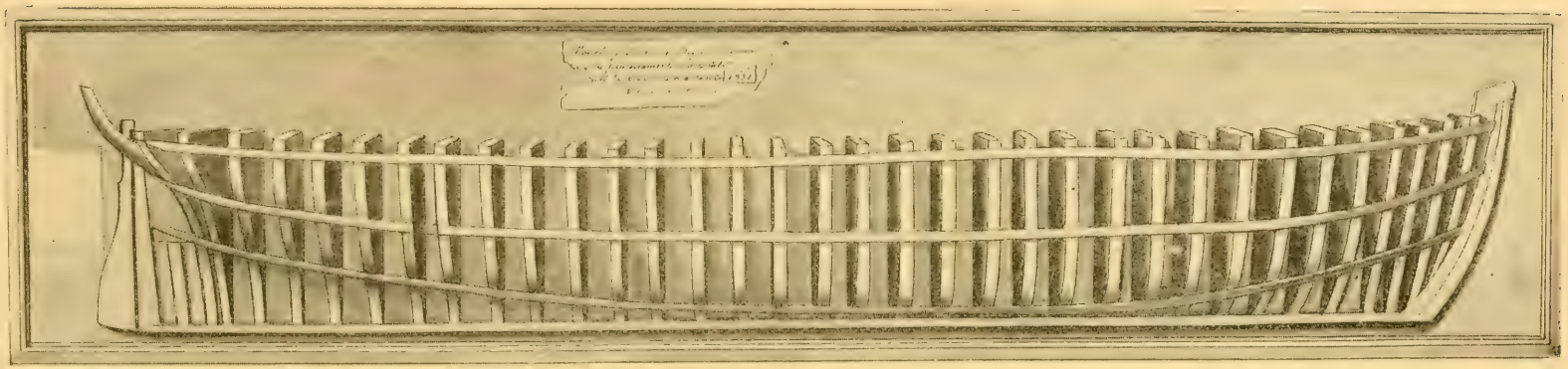
"In accordance with this request, I shall, when the conference rises, have much pleasure in placing the brass tablet in the place selected for it, and I invite the gentlemen specially named in the letter and others to assist me by their presence at the place designated.

"His Excellency then proceeded to the corridor leading to the library of parliament, when, in pursuance to the order of parliament, the memorial brass respecting the 'Royal William' was placed in the position it now occupies. This formal act performed by his Excellency on the occasion of the opening of the colonial conference most fittingly associated the gathering of representatives from the British possessions

MODEL OF STEAMSHIP ROYAL WILLIAM,

The FIRST vessel to CROSS the ATLANTIC under STEAM ALONE Built by George Black in Campbell's shipyard at Wolfe's Cove, QUEBEC. Launched 27th April, 1831. 1,370 tons Cost £16,000. Was towed to Montreal where her engines were put in. Sailed from Pictou, N.S., for Gravesend, England, 17th August, 1833 Commanded by Capt. John MacDougall. Arrived there 11th September, 1833.

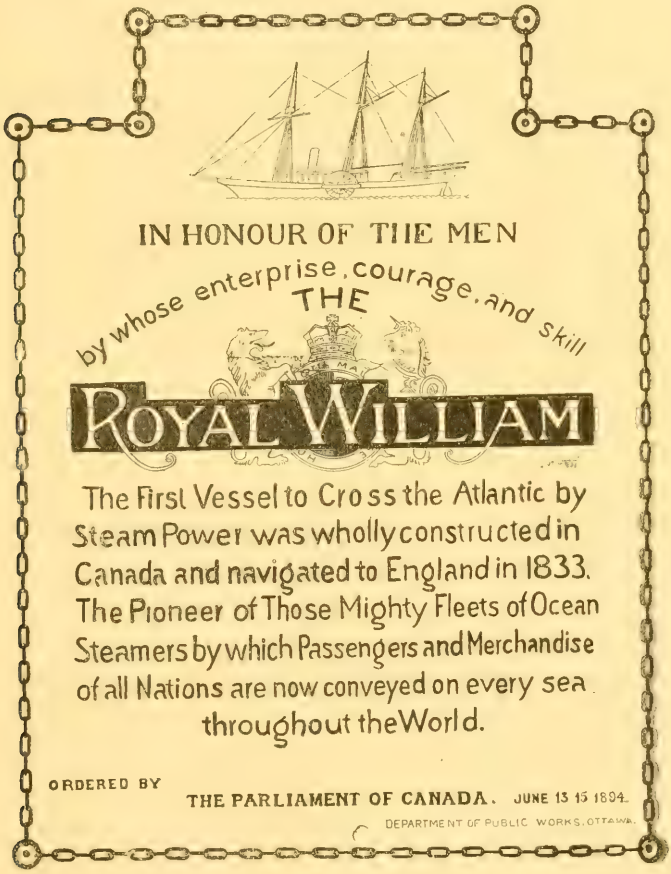
Sold in September, 1834, to the Spanish Government and named "Ysabel Segunda," being the first war steamer the Spaniards ever possessed.



MODEL OF "ROYAL WILLIAM."

in all quarters of the globe with the germ and pioneer of ocean steam navigation, the development of which has rendered the conference possible. The memorial was placed in its position by his Excellency, in presence of the delegates, the speakers of both houses of the Dominion parliament, the members of the government and members of both houses, by members of the Royal Society of Canada on behalf of the Canadian Institute, Toronto, the Literary and Historical Societies of Quebec and Halifax and other associated societies, and by citizens of Ottawa generally, among others the venerable brothers Wicksteed, referred to in the letter on page xi."

The inscription on the memorial brass is as follows:



9. A Lake or Seaside Laboratory in Canada.

The council have much pleasure in calling special attention to the following letter from Professor Knight, of Queen's University, on a

subject of much interest and importance to Canadian naturalists and biologists:

"QUEEN'S UNIVERSITY,

"Kingston, 6th May, 1895.

"*Dr. Bourinot, Hon. Sec., R. S. C., Ottawa.*

"SIR,—I venture to call the attention of the Royal Society of Canada to the desirability of having either a lake or a seaside laboratory in Canada, to which our naturalists could resort for some months every summer and undertake research work. I have myself felt the need of such an institution, and I know of other biologists in Ontario who have felt it also. Last summer, for example, there were seven Canadians working at the marine laboratory at Woodshole, Mass., and I have no doubt that more would have been there if they had known of the advantages offered for study and investigation.

"A beginning could best be made in Canada in connection with the government fish hatcheries, and I am sure that Professor Prince, the fish commissioner, would willingly co-operate with the Royal Society in formulating a plan for such work, and submitting it to the Minister of Marine and Fisheries. Not knowing what equipment is available at the fish hatcheries, I cannot estimate the difficulties that stand in the way of providing facilities for research work at these stations; but assuming that there are vacant rooms in connection with some of them, the chief expense would be that of providing a few deal tables with drawers, some glassware, and a few chemicals and stains. With these things available, and with the stimulus that comes from congenial companions and the criticism of sympathetic workers, we have at hand all the elements of success. Canada ought to make a beginning soon. It seems too bad that her biologists should be compelled to expatriate themselves in order to gratify so harmless an ambition as that of adding a little to the sum of human knowledge.

"I am, dear sir,

"Yours very sincerely,

"A. P. KNIGHT."

The council refer the matter to the consideration of the Fourth Section of the Royal Society.

10. REPORT OF PROGRESS FOR THE YEAR 1894 IN THE SURVEY OF TIDES AND CURRENTS IN CANADIAN WATERS.

The following report by W. Bell Dawson, C.E., engineer in charge of tidal surveys, refers to a subject in which the Royal Society has always taken a deep interest:

"*New Tide-Gauges Established.*

"It was intended to complete during this season the system of principal tide-gauges; but as the survey of the currents was also commenced

this year, and the funds for both purposes were limited to the amount granted in former years for tidal observations only, it was necessary to curtail the total amount of work. It was only possible, therefore, to establish two additional stations for the Gulf of St. Lawrence, and the establishment of stations on the Atlantic coast had to be postponed.

"The stations most required for the gulf were in the Strait of Belle Isle and at Father Point. The tide-gauge at Belle Isle is for tidal purposes a companion to the one on St. Paul Island; as these command the two entrances by which the tides of the Gulf and River St. Lawrence enter from the Atlantic. It was also essential to have a tide-gauge in the Strait of Belle Isle this season, to furnish tidal data for the survey of the currents. The deep channel of 100 fathoms which runs into the mouth of the Lower St. Lawrence ends in the vicinity of Father Point; and from there to Quebec the river is relatively shallow, and the tides are more liable to be affected by the winds. The range of the tide, which in the gulf is less than five feet, increases at Father Point to seventeen feet. It can thus be well observed, as all the fluctuations are so much amplified. This is also a meteorological observatory as well as the pilot station. It is thus a most important and suitable point for a tidal station.

"In the Strait of Belle Isle the tide-gauge was erected on the west side of Forteau Bay. The shelter there is fairly good, as the bay is well within the strait, and it has also the advantage of being at the narrowest part. The chief difficulty is to avoid its destruction by ice in winter. The thickness of the ice along the shores of the strait is only limited by the depth of water in which it will float. Hence if a wharf were to be run out into six feet of water, it would be struck by blocks of six feet in thickness, and so on in proportion; and these blocks have often an impetus from a heavy sea to help them in their work of destruction. The fishermen's wharfs do not, therefore, extend into a greater depth than about three feet at low water; and the tide-gauge was placed on a timber-crib filled with stone, set at the end of one of these wharfs.

"*Records, Tide-Tables, etc.*

"During the year, since last December, the record of the tide has been carried forward continuously at Quebec and Anticosti, and also at St. John, N.B., with the exception of six weeks during the alterations to the gauge. The interruption at St. Paul Island reduces the record there to five months. The new gauge in the Strait of Belle Isle has been in operation since August; and it is hoped that the gauge at Father Point will shortly be in working order.

"It would have been very desirable, had funds permitted, to have established a tide-gauge at Halifax this season to obtain the Atlantic tides for comparison. It was also ascertained that a record of the Halifax tides had been made during the years 1851 and 1852, and through the

kindness of the admiralty this record was obtained. It should be utilized to extend the basis from which the tide-tables for Halifax are calculated, as they now depend on the record taken during two years only, namely, 1860 and 1861. The comparatively small outlay required for this purpose cannot be made at present, however. Since 1891 the tide-tables for Halifax have been issued annually by this department in the form of a small booklet. Its circulation has not been large, and, after correspondence with book-sellers in this country and in Britain with a view to extending its usefulness, it was eventually decided to supply the tables for publication in two lower province almanacs. The tables are accompanied by tidal differences which make them available for the whole Atlantic coast of Nova Scotia.

"At present the record at Quebec and St. John, N.B., is nearly sufficient for the calculation of preliminary tide-tables for these ports. At places where the range of the tide is so great, these tables should show the rise and fall of the tide, as well as the times of high and low water. At Quebec the rise and fall can be referred to the original low water datum of the admiralty charts; as the reference bench-mark still exists which was cut on the building of the department of marine at the time the admiralty surveys were made. At St. John, N.B., there is no bench-mark or other level from which to ascertain with certainty the low water datum adopted in the admiralty surveys, or in the more recent surveys of the harbour made by the department of public works. It is specially important at St. John to have a correct low water datum, not only in the interests of navigation and for such purposes as the construction of slips for repair of vessels, but also because properties are often defined by the low water line. In the absence of any permanent mark to record the results which were before obtained, the only course to take was to commence the work again. A bench-mark was accordingly established on the footing course of the new custom-house building; and for further security its level was also connected with the foundation course of the post-office. To this bench-mark the rise and fall of the tide is now referred, and a satisfactory low water datum will thus in time be obtained.

"*Survey of the Currents.*

"It was considered most important at the outset to ascertain the nature of the currents at the two main entrances to the Gulf of St. Lawrence, namely, in the Strait of Belle Isle and Cabot Strait, between Cape Breton and Newfoundland. The most satisfactory plan would have been to place a surveying vessel in each of these straits, to obtain simultaneous observations over a longer period of time. This could not be arranged for want of means, and the best that could be done was to set apart the steamship 'Lansdowne' for three months in which it could be spared with least inconvenience from its other duties. It was accordingly de-

cided to divide this time between the two places; taking the months of July and September for the Strait of Belle Isle, in order to obtain as different conditions as possible; and taking August for Cabot Strait, in the hope of obtaining more settled weather for so exposed a position. On the first trip to Belle Isle materials were taken for the erection of a tide-gauge in that strait.

"During the season the icebergs in the Strait of Belle Isle were fairly numerous, and every endeavour was made to take advantage of them as 'current floats,' especially to obtain simultaneous comparisons in different parts of the strait. A large proportion of this work was lost, however, as a distant berg might drift further away instead of nearer, or fog might come on to obscure it. The berg might prove to be aground, or it might touch bottom from time to time, and thus be retarded and give a false indication. Also, when many bergs were in sight at once, their movements changed their apparent forms, and their identity was lost unless they were very closely observed. These points are mentioned to show the discretion that is needed in estimating the value of reports as to the nature of currents, which are based on the movements of icebergs viewed from a single standpoint and without instrumental measurements.

"To obtain complete information from an iceberg, some means had to be found to obtain its actual height in feet. The apparent height was then measured with a sextant or a micrometer telescope, and simultaneous bearings taken, at equal intervals of time, and in this way the path of the berg could be laid down on a plan or chart, and the direction and speed of its motion found. Without the actual height, the observations gave relative results only with regard to the direction of the current, which were sometimes useful. Any unusual change in velocity, especially when occurring in shallower water, as shown on the chart, was taken to mean that it touched bottom or was aground for a time; and these suspected parts of its journey were left out of the comparisons made. The effect of the wind on the movement of an iceberg is scarcely appreciable, as so large a proportion of its bulk is below water. This was not, therefore, taken into account.

"There is a widespread impression that the current in the Strait of Belle Isle runs constantly inwards, and on some physical maps, and also on the weather charts issued by the meteorological department, this is definitely represented. A branch from the Arctic current which runs southward along the outer coast of Labrador, is shown to run in at Belle Isle and to find its way out again through Cabot Strait to the Atlantic. On the other hand, the fishermen along the coast seem to believe that the current is usually in the same direction as the prevailing wind at the time. The remark on the admiralty chart is as follows: 'The movements of the water in Belle Isle Strait are made up of a general westerly set affected by tidal streams and winds. The resulting set may be in

either direction.' This remark gives little countenance to the theory of a constant inward flow, and it is in itself sufficiently non-committal to cover almost any condition.

"The idea of a constant inward flow appears to be based on the drift of icebergs, and as they are most usually seen drifting inwards, it has been inferred that this is the constant direction of the current. The converse of this is, however, much nearer the truth; and it may be stated in general, that when icebergs are numerous at the outer end of the strait around Belle Isle, and are also found within the strait, this indicates that the direction of the current has been predominantly inwards from the eastward during the few days previous; while the absence of icebergs indicates a current predominantly outwards from the westward. This refers to the presence or absence in the strait of floating bergs, and not to the presence of bergs which may be aground near either shore. It is also to be noted that only a very small percentage of the bergs off the outer end of the strait ever enter it. Capt. Vaughan, who resided four years on Belle Isle, states, in a pamphlet on the subject, that for ten icebergs which enter the strait there are fifty that pass the mouth and go southward. In doing so they follow the general drift of the Arctic current which passes Belle Isle, and the larger bergs also ground at the entrance to the strait. A section of the strait on a line north from Cape Norman shows no depth exceeding 50 fathoms. The largest berg which was seen this season at the outer end of the strait was aground in 59 fathoms of water off Chateau Bay. Its dimensions above water were as follows: Length, 790 feet; width, 290 feet; height, 105 feet. This may, therefore, be taken as beyond the limiting size of bergs which can enter the strait.

"It may be stated in general terms that the current in the Strait of Belle Isle was found to be fundamentally a tidal one. The best comparisons of the current with the tides showed a complete correspondence between the two, especially during the prevalence of moderate westerly winds. On some occasions there were several days during which the current ran east and west for an equal length of time in each direction and turned regularly in correspondence with the rise and fall of the tide. This may, therefore, be considered as the normal condition of the current. With a heavy and long continued wind, the current would first run for a longer time with it and a shorter time against it, and eventually would run continuously in the same direction as the wind, with a fluctuation in velocity corresponding to the tide. This continuous current might be in either direction according to the direction of the wind.

"From the numerous observations of temperature of the water, taken throughout the season, it is clear that during periods of predominant flow in one direction, the difference in temperature is well marked, and it might, perhaps, be possible to ascertain from extended observations

the amount of the difference to be expected under such conditions above or below the normal temperature for the season. But, at best, the temperature could only be taken to indicate the predominant direction of the current during the few days previous, and could not be relied upon to show its actual direction at the time.

"The temperature of the water has a more important relation to the presence of ice in the strait. When the predominant direction of the current is inward from the east for a few successive tides, it will undoubtedly carry icebergs into the strait if there are any at its outer end at the time. The current from the east is thus not only cold in itself, but also brings in ice with it, which further chills the water in the strait. The cold water, the current from the east and the presence of icebergs within the strait are thus concomitants of each other.

"It is not to be inferred, however, that warm water in the strait is an indication that ice will not be met with, because the water in the strait itself may be relatively warm, notwithstanding that icebergs are numerous at its mouth around Belle Isle, and possibly as far in as the vicinity of Cape Norman. It is possible for this ice to be moving southward with the general Arctic current on both sides of Belle Isle, past the mouth of the strait, without affecting either the direction of the current or the temperature of the strait to any great distance inwards.

"*Summary.*

"In the following summary the general characteristics of the current in the Strait of Belle Isle are given as correctly as they can be deduced from its behaviour during the time the observations were made. The velocities given were measured at the standard depth of 18 feet:

"1. The current is fundamentally tidal in its nature, and, under normal conditions, it runs east and west with velocities which are nearly equal. It attains at times a velocity of two knots per hour in each direction.

"2. The conditions are normal in moderate weather and during the prevalence of moderate westerly winds.

"3. During heavy winds, especially when easterly or westerly in direction, the current, which runs with the wind, becomes stronger than the current against it, and eventually the current may come to be continuous in the same direction as the wind.

"4. The greatest velocities of the current which were observed during heavy winds (in the months of July and September) were as follows: from the east 3·15 knots, and from the west 2·50 knots per hour.

"5. The presence of ice in the strait and the temperature of the water have also a relation to the predominant direction of the current, but they do not afford a reliable indication of its actual direction at the time.

"6. Under normal conditions, and when both surface-current and under-current in the two directions are taken into account, the difference on the average is in favour of a greater inward flow from the east.

"7. The actual flow throughout the year, when the influence of the wind is included, appears also on the whole to be greater in the inward direction from the east than outward from the west.

"*Cabot Strait, or the southeastern entrance to the Gulf of St. Lawrence between Cape Breton and Newfoundland.*

"This entrance to the gulf forms a portion of the deep channel or gully which runs in from the Atlantic between the St. Pierre Bank, on the Newfoundland side, and Banquereau and Misaine Bank, on the Nova Scotia side, and thence traverses the entire width of the gulf, passes between Gaspé and Anticosti and into the mouth of the Lower St. Lawrence. This channel, from the Atlantic inwards, has a width of 40 miles between the banks on each side, and a continuous depth of over 200 fathoms. In passing through Cabot Strait it is not contracted in width or diminished in depth, except by the occurrence of St. Paul Island, which lies near the western side of the deep water. This island rises abruptly from the bottom, and if left dry would probably present the appearance of one of the 'Sugar-loaf' mountains of the adjacent coast. Allowing for the encroachment of this island on the western side of the channel, there is still left between it and Cape Ray a width of 32 miles in which the depth exceeds 200 fathoms, and for the greater part of this width it averages 250 fathoms.

"*Temperatures.*

"The water was found to be a little warmer between Cape North and St. Paul Island than across the main opening of the strait between that island and Cape Ray. The surface temperature there ranged from 55° to 60°, and from the surface the temperature fell gradually with the depth till it reached 32° at about 50 fathoms. At greater depths, from 100 to 200 fathoms, the temperature was again higher and averaged about 40°. This result appeared so anomalous that the matter was carefully investigated, and every precaution taken to insure accuracy.

"The temperatures, so long as they fell regularly with the depth, were taken with registering thermometers of the Miller-Casella pattern. But where there are layers of unequal temperature, such a thermometer will only register the temperature of the coldest layer, irrespective of its depth. For this reason, the temperatures below 50 fathoms were taken with Negretti and Zambra's deep-sea reversing thermometer, which gives the actual temperature at the depth to which it is lowered. This thermometer has to be used with some care, as in very rough weather the

release, which is mechanical, is apt to take place prematurely. Also, if there is much current, the steamer should be free and not anchored, as there is then so much stray line that great depths cannot be correctly measured. It is thus necessary to use time in good weather, specially for this purpose. In the present instance two thermometers were used, which were kept in perfect working order. The thermometers were checked against each other by duplicate readings at the same depth, and were also compared directly with a standard thermometer. Any readings which there was reason to suspect of inaccuracy are omitted from the results given.

"*Summary for Cabot Strait.*

"We thus find in Cabot Strait a current running out of the gulf on the western side, and into the gulf on the eastern side, while in the middle the current is weak and uncertain in direction. The temperature of the water is practically the same in both cases, except within eight miles of Cape North, where it is appreciably warmer. The depth of water in motion appears to be greater on the western side, while on the eastern side the width of the flow is greater and the under-current weaker in proportion. From a comparison of the under-current with the temperature at various depths, it is to be inferred that the movement of the water does not extend to a greater depth than perhaps 60 or 80 fathoms at the most, and below that depth the water appears to be perfectly quiescent. The volume of water leaving the gulf on one side is thus balanced by the volume entering on the other; and as the temperatures are nearly the same, the loss or gain of heat to the gulf is much less marked than it would be if the balance of volume lay between a surface and a bottom current. The actual balance, however, is on the side of loss of heat, as it is the outflowing water near the western side which has the highest temperature.

"As to causes, it is not possible to speak very definitely from observations so limited in time and extent. It is more than likely that the layer of very cold water between 20 and 50 fathoms is the result of the chilling of the water during the winter, and that the warmer water at the surface is due to rise in temperature with the progress of the season. But the reason that the coldest water does not sink to the bottom is by no means clear. If fresh water were in question, the temperature of 39° or 40° would then correspond with maximum density, but the density of sea water increases uniformly as the temperature falls. The increase, however, is exceedingly slight for the range from 41° to 32°, which we have here to deal with; and this allows a possible explanation to be suggested. It would require the admixture of less than $1\frac{1}{2}$ per cent of fresh water with sea water at 32° to give it the same density as unmixed sea water at 41°. The cold water might thus be prevented from sinking if

it were chilled by fresh water ice from the river, which is not unlikely in the circumstances. The bottom water may enter direct from the unmixed water of the Atlantic, as a depth of over 200 fathoms extends uninterruptedly from this strait to the ocean.

"It is clear in any case that there is no cold under-current running out along the bottom of the strait, as might be expected in accordance with the theory of continuous inflow of cold water at the Strait of Belle Isle.

"The influence of the St. Lawrence upon the currents in the gulf is usually much exaggerated. It may, therefore, be well to mention that a current of only half a knot per hour through the Strait of Belle Isle would admit a volume of water forty times greater than the discharge of the St. Lawrence as measured between Montreal and Lake St. Peter.

"The two main currents at the two sides of Cabot Strait are the most important with reference to the interior of the gulf. It is possible that the current on the western side may have some relation to the current running outward along the Gaspé coast, and the reported direction of the current near the Magdalen Islands seems to make this the less improbable. The current along the west coast of Newfoundland might possibly prove to be a continuation of the inward current on the eastern side of Cabot Strait. Further to the northeast, in the narrower part of the gulf towards the Strait of Belle Isle, the current was also found on one occasion to be running from the westward at both sides simultaneously, but the circumstances appear then to have been exceptional, as already pointed out.

"These suggestions are made to show that the currents in Cabot Strait require to be further traced, and this should be done both within and without the strait, and the facts already ascertained will be helpful as a basis in doing so. It may also prove of importance to follow the progressive change of temperature in these currents from the early spring throughout the summer, as this should give light as to the nature of these currents, and would also help in tracing their direction and influence.

"There is thus an ample choice in deciding upon the best direction in which to carry forward the survey of the currents from the basis already obtained. It will also be possible to speak with greater certainty regarding these currents when they have been more extensively followed and investigated."

11. The Proposed Cabot Celebration.

Some interest has been taken by a few historical students in the suggestion that was made last year in the report of the council of the Royal Society that there should be a celebration in Canada on the twenty-fourth day of June, 1897, in honour of John Cabot, who, four centuries ago, in a British ship, manned by English sailors, sailed under the authority of

Henry VII. of England to find a northwest passage to Asia, and succeeded in landing and planting the English flag somewhere on the eastern coast of British North America, in all probability on the shores of the island of Cape Breton.

The learned paper printed by Dr. S. E. Dawson in the twelfth volume of the Transactions on the Cabot voyages of 1497 and 1498, gives additional force to the English claim of having first sailed along the coast of the Gulf of St. Lawrence and the Atlantic sea-board of Nova Scotia, and of the United States as far even as Florida.

So interesting an event in Canadian history seems worthy of commemoration in a tangible shape, and it is therefore recommended that a committee be appointed by the Royal Society to consider the advisability of raising a granite shaft at some point in the province of Nova Scotia.

The general meeting of 1897 could be held on the 24th of June in the city of Halifax for the express purpose.

Little is known of the personal character of John Cabot, and, indeed, his fame has been much obscured by indiscreet eulogists of his son Sebastian, to whom has been given much of that reputation that history now properly ascribes to his father. None of that glamour of romance that must always encircle his Italian countryman, Columbus, has been thrown about the equally intrepid navigator John Cabot, but it is sufficient for our purpose to know that his claim to have been the first to land on Canadian shores is now well established.

Far less of the historic doubt that still surrounds the voyages of the Northmen, nine centuries ago, obscures the record of Cabot's expeditions, and it seems now only an act of justice to a courageous sailor, to whom England and Canada owe so much, that he should not be forgotten, while the Scandinavian, Lief Erricsson, has a monument standing in his honour in the city of Boston.

In the previous reference to this subject the council quoted the eulogistic words of the eminent English geographical scholar, Clement R. Markham, who, like many other eminent writers of these times, has fully recognized the high place of John Cabot among the greatest navigators of the age in which Columbus lived.

His latest biographer, Francesco Tarducci, who successfully claims him as a Venetian by birth, says also with justice:

"It seems to me that one of the very first places in the history of discoveries belongs to John Cabot.

"In these last years the truth has finally triumphed, and the documents found, though few in numbers, yet sufficient for the purpose, have restored to him the light that was due him, and drawn his figure out of the shade and places it in full view.

"For, without any impulse or guidance from others, by the mere force of his will and strength of his enthusiasm, he raised himself far

above the ordinary navigator, and, launching into the fearful solitude of northern oceans, won a new world for England.

"True, he had his son Sebastian for a companion in his victory, but that son was not yet twenty years old in 1497, and could give but little aid to his father.

"If the work of the younger, in a later voyage, was very efficient, it is still John Cabot that led the victorious expedition; to him alone is the discovery of 1497 to be ascribed, and it is his name alone that should receive the acclaim of the English nation.

"If the expedition of 1498 was brought back by the son, it was still unquestionably prepared and for a time conducted by his aged and experienced father.

"No low place can then be assigned to John Cabot in the glorious roll of the discoverers of four centuries ago, but he may be justly placed among the highest, very near the great chief that led them all, the Genoese, Christopher Columbus."

12. Free Public Libraries.

The council of the Royal Society have much pleasure in calling attention to an agitation which the National Council of Women, under the earnest presidency of her Excellency the Countess of Aberdeen, has commenced in favour of the establishment of a free public library in the city of Ottawa and other places in the province of Ontario.

Hitherto entire dependence has been placed in the political capital on the parliamentary library, to which, necessarily, only a minority of the citizens can have access, and that, too, solely when the two Houses are not sitting.

It is to be hoped that this appeal to the public spirit of Ottawa will have some success, and that her citizens will afford an example to other places in the Dominion still behind in this respect.

The Free Libraries Act, which is an illustration of the wisdom of the Ontario Government, has not taken that hold of the public mind that one would naturally expect from a section of the Dominion which has always prided itself on its liberal system of education for the masses. In Massachusetts every town of over one thousand souls has a free library, whilst in Ontario there are only some seven or eight cities and towns that have made any effort in the same praiseworthy direction.

Of course, when we advocate a free library, we are met by the objection that it means taxation of the people for the reading of novels, many of them most injurious to the mind, and leading to a great waste of time which ought to be devoted to studies of a more profitable character. We are quite sure that no one who looks at the mass of rubbish which is yearly circulated by English and American publishers but must feel that there is much force in the objection. It does not certainly say much

for modern culture when one of the most popular novels is "Dodo," which shows very little literary skill and simply exposes the intense frivolity and utter heartlessness of an English woman of fashion, assuredly not among the characteristics of English mothers, whose sons have made England great, and whose daughters have elevated her virtue.

However, whilst no doubt the mass of light literature is wretched in the extreme, it is consoling to think that we have "Marcella" and "The Manxman" to prove that powerful conceptions of human life have not yet entirely disappeared since the days when there were giants indeed in the world of letters.

If Dickens and Thackeray had written nothing else than "David Copperfield" and "The Tale of Two Cities," "The Newcomes" and "Henry Esmond," they would still merit the thanks of Englishmen and their readers the world over. As long, then, as we have the works of Walter Scott, Dickens, Thackeray, George Eliot, Ward, Stevenson, Oliphant and others of note, to delight and instruct the world, we need not fear the establishment of free libraries. After all, a free library is an inducement to men and women to spend their time more profitably than is possible in places where one does not exist. Light literature wearies after a while, and the mind must, in most cases, turn to the more invigorating and healthy books that every well furnished library has on its shelves.

13. Library Catalogues.

We should like to see published ere long in convenient form, for the use of libraries and students generally, such a catalogue of the only national library Canada possesses—the parliamentary library at Ottawa—as has been recently printed by the Royal Colonial Institute, which has done such good service for the empire since its foundation in 1868. This handsome catalogue of its library cannot fail to be of much use to Englishmen and the numerous persons in London who require information from time to time on colonial questions. It is compiled in such a manner as to show the full titles of the works upon each colony in the order of publication, together with an index of authors and contents, which makes it historical as well as illustrative in its character. The book is divided into sections, in which the literature of every colony is so arranged that the works upon any special subject connected with its history, government, trade and development may be followed from its foundation to the present time. For instance, if we wish for information upon a particular subject, we need only refer to the headings on Colonial Botany and Flora, Imperial Federation, Emigration, Transactions of Societies, West Indies, Voyages and Circumnavigation, and so on. In order further to increase the utility of the catalogue for purposes of reference, the contents of all the chief collections of voyages, such as Hakluyt, Purchas,

and articles from encyclopædias, periodicals and proceedings of learned societies, are placed under the colonies to which they refer. Canadian authors are fairly well represented in this well-stocked library. In the fifty large octavo pages the titles of their works take up, we see the names of Robert Bell, J. G. Bourinot, G. Bryce, Æneas Dawson, G. M. Dawson, Sir J. W. Dawson, G. T. Denison, S. Fleming, N. F. Davin, S. E. Dawson, E. Gilpin, G. M. Grant, T. C. Haliburton ("Sam Slick"), A. Harvey, Sir F. Hincks, J. Howe, J. Hannay, J. M. LeMoine, Lady Macdonald, J. Macoun, A. Morris, G. Parker, G. Patterson, D. B. Read, C. G. D. Roberts, H. Scadding, J. Schultz, G. Stewart, Sir D. Wilson, and a few others who have contributed pamphlets and works of less note. Canadian authors and others would do good service by sending copies of books to a library which is most useful to all colonial dependencies and the students of their history and resources. Mr. Bossé, the librarian, who has compiled this catalogue with so much industry and intelligence, is an earnest student of colonial questions, always ready to assist those who require to make researches in this library.

14. Royal Society Bibliography.

The previous paragraph recalls the fact that the Royal Society of Canada is also doing useful work in the same direction. In the twelfth volume of the Transactions, there will appear a bibliography of the members of the society. This compilation will be exceptionably valuable since it will cover the scientific and literary works of men like Sir J. W. Dawson, Abbé Casgrain, Evan McColl, Abbé Gosselin, W. Kirby, Mgr. Tanguay, Abbé Verreau, H. Hale, Rev. Moses Harvey, Rev. G. Patterson, Dr. Kingsford, S. Fleming, Mgr. Hamel, Abbé Laflamme, Dr. Selwyn, Rev. Dr. Williamson, Dr. G. Lawson and some others who have been earnest workers in the world of science and literature for the past forty years. In addition to the bibliography of these old workers, there are some seventy and more names of the younger literary and scientific men of Canada. Practically the collection covers the most important and scientific and literary work that has been done in Canada for the most active period, so far, of its intellectual development. As the work includes all important articles that have been written by Canadian authors in periodicals, as well as pamphlets and books, it will be seen that it is a most important contribution to bibliographical literature, and invaluable as a work of reference.

15. The Archives of Canada.

In this bibliography of the Royal Society there also appears an excellent summary of the work done in the dominion department of Archives up to the present time, under the direction of Dr. Brymner, in the form of an analysis of the contents of each of its reports since the

establishment of this extremely useful branch of the public service whose importance is hardly yet as fully understood as it ought to be by the general public. Students at home or abroad, however, fully recognize the value and the efficient manner in which it is conducted by Dr. Brymner.

It is to be hoped that the dominion government will ere long be able to afford more suitable accommodation for the valuable collections of the documents and books that have already been collected within the few years this service has been in existence. Sufficient importance, we are afraid, has not been always heretofore paid to the preservation of historic documents relating to our past history and as a consequence much has been lost to posterity.

For instance, it is a matter of public notoriety that the original papers connected with the Quebec conference of 1864 when confederation was provisionally adopted by delegates from the several provinces of British North America, cannot be found in any of the public departments.

It is a melancholy commentary on public indifference to historical evidence that papers of such supreme importance should not be preserved as memorials of the most memorable event so far in our national annals.

The society have obtained the following information with respect to the copying of the Archives :

"As the copying of the state papers and other documents in the various government offices in London relating to the old province of Quebec and to Upper and Lower Canada was approaching completion, it became necessary, in order to secure continuance of the work, that the documents relating to the other provinces should be examined with a view to have them transcribed, so as to make them accessible to historical investigations in Canada.

"In accordance with the determination to have the work of research prosecuted, Dr. Brymner, the archivist, proceeded to London in the latter part of 1892, and immediately on his arrival entered upon the task, visiting the Record Office, the various government offices, the British Museum, Lambeth Palace, the rooms of the Society for the Propagation of the Gospel, and the Moravian missions, much ecclesiastical history having been obtained from the three last named places bearing on the progress of the provinces.

"The searches were exhaustive, and extend from 1603 down to 1801, covering the history of Nova Scotia and the provinces which were formed out of its original territorial extent, namely, Prince Edward Island (originally St. John Island) in 1769, New Brunswick and Cape Breton in 1784, and papers relating to Hudson's Bay. The length of the abstracts may, however, make it impossible to publish all the results in one report, but should that be the case, there is no doubt the whole will be completed in the report for 1895."

16. The Parkman Memorial.

The honorary secretary has been requested to lay the following circular before the Royal Society and all those whom its members may influence throughout Canada :

"In the garden he created and by the shores of the lake he loved so well, both now destined to become a part of the public park system of his native city, his friends desire to raise a memorial to Francis Parkman, that the people of Boston, for all time, may be reminded that this man of high endeavour, heroic constancy and noble achievements, once lived among them.

"That this memorial may be a proper one, and that it may represent the esteem in which Mr. Parkman was held by his contemporaries, this committee, chosen from among the number of his friends, asks the co-operation of all men and women who may desire to help it carry out this purpose.

"Subscriptions of any sums, however small, will be welcome.

"Martin Brimner,
"Leverett Saltonstall,
"Henry L. Higginson,
"Charles S. Sargent,
"Lorin F. Deland, } *Committee.*"

Subscriptions may be sent direct to the treasurer, Mr. L. Higginson, 44 State street, Boston, or to the honorary secretary of the Royal Society, who will gladly in this way show his interest in a matter which every Canadian who can should promote.

The council of the Royal Society feel that Canadians will not forget those men and women who have done them good service in their day and generation. Francis Parkman was not a Canadian by birth, but he was one in spirit and work. Literature, at all events, knows no geographical bounds. The names of Longfellow and Lowell look down on us from the walls of that national temple in which England has raised memorials of her own great poets, historians and heroes.

17. The Decease of Members.

Since the society last met in this hall four deaths have occurred among its members, each of whom did good work in his day and generation. Vicar-General Dawson had completed a life in which he had won the kindliest regards of all religious sects by the exhibition of those genial and generous qualities which won on the sympathetic nature of all with whom he came in contact. The spirit of christian charity and liberality which was a striking feature of his character should commend itself much to us all, in a country where forbearance in matters of reli-

gious and sectarian feeling is so essential to the destruction of sectionalism, and the strengthening of national unity.

In Senator Tassé, who died in the meridian of life, we had a cultured representative of the French Canadian race; and when we recall the excellent historic work he did, and how much he was capable of doing in this branch of literature, we could almost regret that he was forced by the conditions of his life and the force of personal circumstances to devote his best years almost entirely to the evanescent pursuit of journalism, and the uncertainties and anxieties of political life.

In Mr. Carpmael the society lost one of its earliest and ablest members, who had from the outset much confidence in its success and its opportunities in the future for promoting the study of science and literaeure in this Dominion, still in a measure in the infancy of its cultured life and in the early stages of its material development.

Hardly had these words of sorrow been penned when another member was added to the list of the dead. Only eight days before the present meeting Dr. Marmette was called to swell the great majority without an hour's warning, to the deep regret of the many friends he had in French Canada, where he had been long admired for his fine literary taste and his valuable contributions to the literature of his country. His amiability in social intercourse, and his readiness to sympathize with the literary ambition of others, will be recognized by all those who knew him well. He was still in the prime of his intellect when he laid down his pen for ever.

In this connection the council may recall the fact that the portraits of these gentlemen, as well as of nearly all the original members of the Royal Society, are now in the possession of the honorary secretary, until such times as the society has a suitable place to hang these pictures, which, from year to year, as men fall from its ranks, must possess more and more a historic interest for those who remain or come after us.

General Business.

On motion of Mr. Saunders, seconded by Dr. Stewart, it was resolved that the report of the council be forthwith taken into consideration.

Dr. Selwyn moved, seconded by Archbishop O'Brien,

That the printing committee, composed of Dr. Bourinot, Dr. S. E. Dawson and M. DeCelles be authorized to print and publish the Transactions, commencing with a new series, in the form of royal octavo, as proposed in the case of the Royal Society of England, and to make such other arrangements as may conduce to economy and efficiency.

Dr. Johnson moved in amendment, seconded by Dr. G. M. Dawson,

That the debate be adjourned until the following day.

And the question being put on the said amendment, it was negatived, and the main motion resolved in the affirmative.

The following motions were agreed to :

(1) *Resolved*, That this society approves of the suggestion made by the council to hold a Cabot celebration in the month of June, 1897, in the city of Halifax, and appoints Drs. Fleming, Bourinot, S. E. Dawson and Archbishop O'Brien as a committee to take such steps as may be necessary in this direction, and to report to the council and society at its next general meeting in 1896. (On motion of Dr. Sandford Fleming, seconded by Rev. Prof. Clark.)

(2) *Resolved*, That for the future each member of the society shall deposit with the honorary secretary his photograph, in not less than cabinet size. (On motion of Prof. Penhallow, seconded by Dr. Mills.)

(3) *Resolved*, That Prof. Callendar, of McGill University, be elected a member of the third section of this society. (On motion of Prof. H. T. Bovey, seconded by Dr. S. Fleming.)

(4) *Resolved*, That the rules of the society be suspended to allow section III. proceeding to the election of a member to fill up the vacancy caused by the death of Prof. Carpmael. (On motion of Dr. Girdwood, seconded by Prof. Bovey.)

(5) *Resolved*, That a special committee to assist and advise the council in the matter of the change in the astronomical day and other scientific questions be appointed, and that the committee consist of Mgr Hamel, Dr. Johnson, Dr. Bovey, Prof. Dupuis, Sandford Fleming, Prof. Ramsay Wright, Mr. Deville. (On motion of Dr. Fleming, seconded by Prof. Johnson.)

(6) *Resolved*, That the foregoing be made a standing committee. (On motion of Prof. Bovey, seconded by Dr. Fleming.)

(7) *Resolved*, That the names of gentlemen once nominated as members of this society be all put upon the voting paper, so that there shall be no doubt whom the electors are voting for. (On motion of Dr. Girdwood, seconded by Dr. Selwyn.)

The reports of delegates of associated societies were then called, in the following order:

I.—From *The Pioneer and Historical Association of the Province of Ontario*, through Captain CRUIKSHANK.

This important association was organized in 1887, in Toronto, under the presidency of the Rev. Dr. Scadding.

Its members are delegates from the several local historical societies of Ontario. Their numbers are yearly increasing, and fresh interest is added in "promoting the intercourse and union of all such societies, for the better preservation of historical and other records and memorials of the province, for the forming of new societies and such purposes, and for promoting and extending the influence and benefits thereof." (Constitution, second paragraph.)

Its officers are annually elected on the first Wednesday in June. The next annual meeting will be at Brampton, in the county of Peel. A second meeting of the association will take place on one of the days during the great annual exhibition in September, in Toronto. These meetings are becoming more interesting and important. The reports received from the local societies indicate that each one is doing its share of active work in rearing the noble structure of Canadian history.

New subjects also are frequently introduced by members, to the great pleasure and profit of all present, and through them and the excellent reports given by the press made known to the people at large. Under the auspices of local societies, many hundred pages of useful history have recently been published relating to the early days of Canada, which have already attracted the attention of the Minister of Education and other authorities of Ontario, and of many readers of history in the United States. The study of Canadian archives is now more highly regarded than ever, but to make the history of a country complete every locality must furnish its part.

II.—From *The Lundy's Lane Historical Society*, through Captain Cruikshank.

This society was organized in 1887, and is in affiliation with the Pioneer and Historical Association of Ontario. Since its formation it has been actively employed in promoting the study and cultivation of Canadian history relating chiefly to the American revolution of the last century and the war of 1812-14.

The following is a brief list of the society's recent publications:

"The Story of the Butler's Rangers." (Revolution.)

"The Battle of Queenston Heights, 1812." (Second edition.)

"The Fight in the Beechwoods, 1813." (Second edition.)

"The Battle of Lundy's Lane, 1814." (Third edition.)

"The Story of Laura Secord, 1813."

"Canada. In Memoriam. 1812-14."

"The Servos Family." (Revolution.)

"A Loyal Sermon, preached in Stamford, near Lundy's Lane, June, 1814."

"Niagara One Hundred Years Ago."

"A Centenary Study."

These pamphlets have elicited much attention throughout Canada, and have been recommended for use in the high schools of Ontario. Letters from distinguished writers in the United States regard several of them as most important and valuable publications, filling blanks long felt in American history in relation to the revolution and war of 1812-14.

The Lundy's Lane Society has also given much attention to the care and history of several old burial places situated in the neighbourhood of the Niagara River.

The attention of the Dominion government has been successfully drawn to the subject of giving honour to the memories of the brave dead who fought in the last and decisive battle of Lundy's Lane, 1814, in defence of the Niagara frontier. A worthy monument will shortly be erected on the famous old battle-ground, which immediately became the military cemetery of the district.

III.—From *The York Pioneer and Historical Society*, through Captain CRUIKSHANK.

This local society was the first organization of the kind in Ontario, twenty-four years ago. It has a long list of members in Toronto and country, and is first in affiliation with the Provincial Pioneer and Historical Association of Ontario.

The following items are from the secretary's last annual report:

"Papers read by members during the year: Mr. Charles Durand, On making Maple-sugar in Pioneer Days; a paper by the president, Dr. Scadding, giving an account of a journal kept by the wife of the first governor of Upper Canada, during a passage down the St. Lawrence in 1796; Reminiscences of Chief Brant, by the president; Some very remarkable facts about the Life of General Brock, by Mrs. Curzon; Extracts from a Journal compiled by Eli Goram, read by D. B. Read. Mr. Charles Durand gave a very interesting lecture entitled 'From the Year 1800 to 1833.'

"The York Pioneers have taken part in a movement for the erection of a monument to the first lieutenant-governor of Upper Canada, Simcoe, and for the publication by the local government of an annual volume of archives."

IV.—From *The Peel Pioneers' Society*, Brampton, through Captain CRUIKSHANK.

The society was organized in 1887, and continues to hold monthly meetings of great interest to the old families of that early settled county. It has a long list of members. Papers are published by the local press.

The Wentworth Pioneer and Historical Society

was organized in 1889. The secretary reports a membership of 220 members. Several pamphlets of historical value have been published. Meetings are held monthly. The society is zealously promoting the erection of a monument on the famous battle-ground of Stoney Creek, June 5, 1813.

V.—From *The Simcoe County Pioneer and Historical Society*, Barrie, through Captain CRUIKSHANK.

This young and vigorous society was organized in 1891, and, like the preceding societies, is in affiliation with the Provincial Association. The

proceedings and work of the society are published in detail by the local press of the county. Historic discoveries of much interest are reported by the secretary—of Willow Creek Landing, used during the war of 1812-14, and of the old Nine-mile Portage, near the town of Barrie.

Grenville Pioneer and Historical Society, 1891.

The qualification for membership is that an ancestor of the candidate was a resident in Canada in 1792.

Niagara Town Historical Society

has given largely to the structure of Canadian history by the writings of W. Kirby, F.R.S., and Miss Janet Carnochan. Forts George and Mississaugue are points of special interest.

Thorold and Beaverdams Historical Society, 1894,

is young but strong, and has already added much to the history attached to Decew Falls and Beaverdams (now Thorold), the site of the battle of Beechwoods—important factors in the war of 1812-14.

Other societies—*Kingston* and *Frontenac*, also *The Bay of Quinté*—are doing most important work of greatest historic value in the richest fields of Upper Canada. Kingston district is historic ground of more than three centuries. The Bay of Quinté district, in the early period of 280 years ago, was under French rule, and the scene of the fiercest conflicts between the Indian tribes. Here also Champlain was thwarted in his efforts of discovery, and thence returned to France.

VI.—From *La Société historique de Montréal*, through Prof. DeFoville.

La Société historique de Montréal n'a pas eu l'honneur de présenter de rapport à la Société royale depuis 1891.

Des travaux exécutés aux édifices où elle se réunissait l'ont forcée de suspendre ses séances habituelles, et de renfermer dans des caisses ses papiers et ses livres, pour les soustraire aux accidents. Elle avait commencé l'impression du livre d'ordres du maréchal Dieskau. Elle y avait ajouté des notes intéressantes sur le maréchal et sur les régiments amenés par lui en Canada. Tout était imprimé, moins les tables, que l'on était à terminer, quand un incendie a réduit en cendres l'établissement et détruit tout ce qui était imprimé de notre mémoire.

Pour faire face à ces deux contretemps, et en attendant qu'il lui fût possible de reprendre le cours de ses assemblées régulières, la Société historique décida d'ériger un monument qui rappelât la fondation de Montréal, et indiquât en même temps l'endroit qui a été l'humble berceau de la métropole commerciale du Canada.

Le conseil de ville, sur notre requête, voulut bien accorder le terrain nécessaire et dans l'endroit demandé. MM. Raphaël Bellemare, auteur

du projet, J.-U.-A. Beaudry et E.-L. de Bellefeuille, membres de la Société, furent chargés de surveiller les travaux. Différents obstacles ont prolongé ces travaux au delà de l'époque fixée, et ils n'ont été terminés que l'année dernière.

Le monument est un obélisque ; il se compose d'une base carrée de dix pieds de côté, et d'un monolithe de trente pieds de haut, le tout en granit gris du Canada. Sur les faces de la base ont été encastrées des tables de bronze qui portent des inscriptions convenables.

Voici celle qui résume le mieux notre pensée et nos intentions :

Le 18 mai 1642,
Près de cet obélisque,
Entre
Le fleuve et la rivière qui coule sous la rue des Commissaires
A
L'endroit appelé *Place Royale* par Champlain le 28 mai 1611,
Paul de Chomedey de Maisonneuve
Jeta les fondations de la ville de Montréal.
Il érigea
Les premières habitations, le fort, la chapelle, le cimetière,
Qu'il enferma dans une enceinte de pieux.

Le 23 février 1642
Montréal avait été consacré à la sainte Vierge
Sous le nom de Ville-Marie.

Le 13 février 1644
Louis XIV lui accorda sa première charte civique.

Le 26 mars 1644
Chomedey de Maisonneuve
en
Fut nommé premier gouverneur particulier.

Le monolithe a été placé sur sa base le 17 mai l'année dernière, veille du 252e anniversaire de la fondation de Montréal, en présence de plusieurs membres de la Société historique et de quelques citoyens distingués.

Le monument est modeste, sans doute, mais il consacre des souvenirs précieux, et la Société historique a été heureuse de le faire exécuter avec ses propres fonds, sans faire appel à la générosité publique.

Depuis le dernier rapport, nous avons eu le regret de perdre quelques uns de nos membres actifs distingués, entre autres MM. J.-C. Taché, l'abbé Desmazures et Joseph Tassé ; parmi nos membres correspondants, M. O'Reilly, ancien juge à Rouen ; et parmi nos membres honoraires, M. Marmier, de l'Académie française.

Nous comptons encore soixante-quatre membres actifs et sept membres correspondants.

Notre bibliothèque continue à s'augmenter—quoique lentement—par nos échanges et pár les dons de quelques amis généreux. Enfin, la Société a decidé de reprendre la suite de ses publications, et de commencer par le

livre d'ordres du maréchal Dieskau, dont elle espère pouvoir, cette fois, mener l'impression à bonne fin.

VII.—From *The Hamilton Association for the Promotion of Literature, Science and Art*, through Mr. H. B. SMAEL.

The council of the Hamilton Association takes pleasure in presenting to the Royal Society a report of the association's work during the past year.

The general meetings of the society, held monthly, have been more largely attended than usual, so that the aim of the council to interest the public in the work of the association has met with even greater success than was anticipated. It was felt that by confining the more technical papers to the different sections and subsections of the society, in which the real work of the association is done, room would be left for more popular papers at the open meetings.

The papers read at the general meetings were as follow:

1894.

Dec. 10—"A Sketch of the History of the Canadian Indians from the Earliest Times to the Conquest of Canada by the French," by P. E. Jones, M.D., himself an Indian.

At this meeting, Chechock, a chief of the Cherokees, gave an interesting talk on Cherokee folk-songs.

1895.

Jan. 10—"The Last Thirty Years of European History," by J. H. Long, M.A., LL.B.

Feb. 14—"Monkeys and their Speech," by Prof. Garner, introduced by the president.

March 14—"A History of the County of Wentworth," by J. H. Smith.

April 10—"Idyl of a Rambler," by H. B. Small.

April 10—"Some Unpublished Facts and Letters about the Battle of Stoney Creek," by Douglas Brymner.

The museum, under the care of C. C. Grant and Alex. Gaviller, steadily grows, and is already too large for its present quarters. It is open every Saturday to the public, and is well visited.

The geological, physical and philological sections have been doing their normal amount of work, and are steadily increasing their membership. The photographic section, enthusiastic as ever in their labours, gave a two days' public exhibition of their work in the association rooms, and have had one or two "lantern nights."

The officers of the association for 1895-96, elected at the annual meeting, May 9th, are:

President—S. Briggs.

First Vice-President—A. T. Neill.

Second Vice-President—A. E. Walker.

Corresponding Secretary—J. H. Long, M.A., LL.B.

Recording Secretary—S. A. Morgan, B.A.

Assistant Secretary—W. Chapman.

Treasurer—J. M. Burns.

Curator and Librarian—Alex. Gaviller.

Members of Council—P. L. Scriven, W. H. Elliott, B.A., H. McLaren, Thos. Morris, Jr.

The members of the biological section have made many and valuable additions to the herbarium of Canadian wild flowers, all found within our twelve-mile limit, the additions being thirty-seven species, representing in all sixteen genera.

The collection of Jamaica ferns donated by Mr. Adam Brown has also been carefully mounted. These represent one hundred and two species of twenty-two genera.

The valuable collection of Arizona and Mexican ferns devised to the association by the late Prof. Wright holds a place also in the herbarium.

The geological section has been peculiarly active. Hamilton is credited now with three new genera and seven new species of fossil sponges. The graptolites, which are especially numerous in this locality, have attracted notice everywhere.

Mr. A. E. Walker's forty years' collection of fossils now occupies a place in our museum. One specimen, especially noteworthy, obtained from the Utica shale, has a circular mass of spicules on its surface, bearing a close resemblance to those found in the Niagara chert beds at Hamilton. It is undoubtedly a connecting link between the glass-rope sponges and allied forms of to-day and their predecessors of the far-off ages.

The association is doing good work, and its operations are evidently appreciated by the public.

The Transactions are eagerly sought for, and form a valuable record of what is being done yearly by the various branches and subdivisions of the association.

VIII.—From *The Numismatic and Archæological Society of Montreal*, through Mr. Rouer Roy.

En qualité de délégué de la Société de Numismatique et Archéologie de Montréal, j'ai l'honneur de présenter un rapport sur ce qui s'est passé chez elle pendant l'année qui vient de s'écouler.

Poursuivant le but de son organisation, la Société s'est occupée, dans ses réunions, de rechercher tout ce qui pouvait se rapporter soit à la numismatique soit à l'archéologie particulières au Canada, à la province de Québec, et surtout à la ville de Montréal.

Elle a, grâce à des dons assez nombreux, pu ajouter à sa collection, déjà considérable, plusieurs pièces de monnaie, des médailles de date

ancienne, et dont il ne reste que peu d'exemplaires, des photographies représentant d'anciens bâtiments maintenant disparus, des fragments de constructions auxquelles se rattachent des souvenirs des premiers temps de la ville. Parmi ces objets, il en est qui sont destinés à perpétuer la mémoire de "Notre-Dame-de-Bonsecours", bâtie en 1658, ainsi que d'une maison érigée en 1670, au coin des rues St-Paul et St-Nicolas, et autrefois occupée par les bureaux de la Société des Fourrures, dont Migeon de Bronsac était le gérant.

On a aussi recueilli des publications, des journaux, quelques manuscrits datant du dix-septième siècle, et d'autant plus précieux qu'il serait aujourd'hui impossible de s'en procurer des doubles. La Société est heureuse de pouvoir ainsi sauver de la destruction des documents répandant la lumière sur des événements qui sans cela demeureraient pour toujours ignorés.

Des échanges de journaux, de périodiques et d'essais avec plusieurs sociétés étrangères procurent aux membres de la Société qui veulent étudier, une occasion favorable d'accroître leurs connaissances.

Dans le cours de cette année, il s'est produit un événement de nature à donner un nouvel essor aux aspirations de la Société, et auquel elle attache une grande importance, tant au point de vue archéologique qu'au point de vue de l'éducation en général.

Depuis longtemps elle songeait à trouver dans Montréal un local où elle pût réunir et placer la collection d'objets historiques qu'elle possède ; elle avait déjà, dans une exposition provinciale, mis sous les yeux du public une partie de ces objets, et elle avait en cette occasion obtenu un grand succès.

Lors donc que le gouvernement annonça la mise en vente du château de Ramezay, dont la démolition devait nécessairement suivre de près l'adjudication, elle fit tous ses efforts pour préserver ce vieux monument. Comme ses moyens ne lui permettaient pas de l'acquérir elle-même, la Société, appuyée de plusieurs citoyens notables, s'adressa au conseil de ville, pour le prier de se porter acquéreur de la propriété, dans le but d'y établir un musée.

En accueillant favorablement cette demande, le conseil conservait à la ville un de ses plus anciens monuments, si non le plus ancien, et contribuait en même temps à la création d'un musée destiné à intéresser les citoyens aux recherches qui portent sur les premiers temps de son histoire.

La propriété fut adjugée à la ville le 24 octobre 1893. Le titre d'acquisition porte la date du 5 mars dernier. Par bail du 25 avril, la Société obtenait la possession de l'immeuble, et Son Honneur le maire le lui livrait le même jour. Depuis elle a pris les moyens de faire exécuter les réparations nécessaires pour l'installation de sa collection.

Le château a été érigé en 1709 par Claude de Ramezay, sieur de Lagesse, gouverneur de Montréal d'abord, et ensuite administrateur de la colonie ; il y fit sa résidence pendant une vingtaine d'années. Charles Lemoyne, baron de Longueuil, gouverneur de Montréal, l'habita ensuite. La Compagnie des Indes y tint son principal comptoir pour le commerce des fourrures pendant plusieurs années, vers le milieu du siècle dernier. En 1762, le gouvernement provincial en fit l'acquisition, et le destina de nouveau à l'usage des gouverneurs.

En 1775, lors de l'invasion de la ville par les troupes américaines, le commandant militaire y établit son quartier général, et c'est de là que furent lancés les proclamations et appels aux Canadiens, dans lesquels on invitait ceux-ci, au moyen de séduisantes promesses, à renoncer à l'Angleterre et à entrer dans la confédération américaine.

La mort du général Montgomery survenue sur ces entrefaites, détermina la retraite de l'armée ennemie, et, en 1776, le château fut rendu à l'usage des gouverneurs.

Pendant les troubles de 1837-8, il devint le siège du conseil spécial ; depuis lors, les cours de justice, l'école normale, l'université Laval, y ont tour à tour tenu leurs séances jusqu'au moment où la ville en est devenue propriétaire.

Telle est, en résumé, l'histoire de ce monument remarquable à tant de titres ; seul, de tout ce qui constituait le vieux Montréal, il reste debout, ayant résisté aux coups du temps et aux nombreuses transformations qui ont fait de Montréal une ville moderne ; témoin d'événements mémorables, qui se sont produits sous les deux régimes, il en évoquera le souvenir chez l'historien désireux de s'instruire sur les débuts de la colonie.

La Société n'aurait pu désirer un local plus propre à la poursuite de ses recherches, aussi ne saurait-elle trop se féliciter de l'acquisition qu'elle en a faite ; il est vrai qu'elle n'en est que locataire pour le moment, mais elle a lieu d'espérer d'en retenir la possession pour un temps indéfini.

Sous peu, le public et les visiteurs étrangers y trouveront une collection précieuse de pièces de monnaie, de documents inédits, d'objets antiques, puis une galerie de portraits représentant les hommes les plus notables de la période qui a précédé la cession de la colonie à la Grande-Bretagne ainsi que de celle qui l'a suivie ; les gouverneurs des deux régimes y figureront pour la plupart.

Pour peu que la Société soit encouragée des autorités et des citoyens, elle ne craint pas de dire que le musée qu'elle est en frais d'organiser, et pour lequel elle a déja à sa disposition un matériel important, sera, en même temps qu'un honneur pour Montréal, un centre d'attraction pour les hommes instruits et pour le public.

IX.—From *The Natural History Society of Montreal*, through Mr. Justice WÜRTELE.

The Natural History Society of Montreal has this year again availed itself of the privilege of sending a delegate to represent it at the annual meeting of the Royal Society of Canada.

The work of the society has been carried on during the present year in an efficient manner, and it is a cause of satisfaction to be able to state that there has been an increased attendance at the monthly and other meetings of the society, showing that the members appreciate the importance of its work.

The museum is now being thoroughly overhauled, and the specimens are being renamed. During the present year a larger number of donations from friends of the society have been made, including one from the Council of Arts, through the secretary, Mr. S. C. Stevenson, showing that the public, as well as the members, have an interest in the work of the society. It is also pleasing to note that the attendance during the present year of outsiders at the museum on Saturdays, on which day the museum is free to the public, has been nearly double that of previous years.

The society is fully impressed with the desirability of continuing the publication of "The Canadian Record of Science," and has made arrangements to do so. It has appropriated from its funds an annual sum of $200, and it hopes in the future, as it has done this year, to replace the annual grant of $400, which the government has discontinued, by the subscriptions of the generous patrons of science to be found in Montreal. It may be mentioned that the circulation of "The Record" has increased, and that in view of this fact and of the value of the work, the society is firmly determined, even at the cost of a heavy inroad on its finances, to continue its quarterly publication.

The project of the affiliation with it of other kindred associations is still engaging the attention of the society. Besides the increase to its membership from the members of the affiliated societies who have become associate members, there has also been an increase this year on the roll of ordinary members.

The annual field-day last year took place on the 2nd June, and was largely attended. The excursion was on the Montreal and Western Railway, to the village of Sault-aux-Iroquois, now called Labelle, in honour of the great colonizing priest of that name, where the excursionists were most cordially received; and while the excursion afforded both enjoyment and an opportunity for research to the members and their friends, it also realized a profit, which was an acceptable addition to the funds of the society. This year the excursion on the annual field-day will be to Philipsburg, on Missisquoi Bay.

The following papers were read and discussed at the monthly meetings of the society:

Oct. 29—"Bivalve Shells in the Coal Formation, and what they teach," by Sir J. Wm. Dawson, C.M.G., LL.D., F.R.S.

Oct. 29—"The Effects of Great Pressure on Rock Structure," by Prof. F. D. Adams, M.Ap.Sc., Ph.D.

Nov. 26—"The Mechanism of the Horse's Foot, and its Management, from a humane standpoint," by Prof. D. McEachran, F.R.C.V.S. Eng.

Nov. 26—"The Psychic Development of Young Animals, and its Physical Correlation," by Prof. T. Wesley Mills, M.A., M.D.

Jan. 28—"Meteorites and what they signify," by Prof. B. J. Harrington, B.A., Ph.D.

Jan. 28—"Unusual Occurrence of Razor-billed Auk at Montreal; Remarkable Flight of Certain Birds from the Atlantic Coast up the St. Lawrence to the Great Lakes," by E. D. Wintle, Esq.

Feb. 25—"Dimorphism and Polymorphism in Butterflies," by H. H. Lyman, M.A.

Feb. 25—"Additional Remarks on the Flora of the Island of Montreal," by Rev. R. Campbell, D.D.

March 25—"Ancient Engineering," by Prof. J. T. Nicholson, B.Sc.

April 29—"Canada's Timber Resources and Lumber Industry, with some Reminiscences of those connected with the Trade," by the Hon. J. K. Ward.

On the last mentioned date Mr. J. B. Williams was to have read a paper on "Birds: what are they; where are they; and whence are they?" but time did not allow it to be done; he will, however, favour the society by reading it at the next monthly meeting.

The course of the Somerville lectures this year was on "The Resources of Canada as viewed by a Naturalist." The lectures were delivered on the Thursdays from the 7th February to the 21st March, inclusively; they were free to the public and were well attended. The museum was open to the public for one hour previously to each lecture.

The lectures were as follows:

1. "The General Geographical Relations of Canada," by Sir J. Wm. Dawson, LL.D., F.R.S.
2. "The Useful Minerals of Canada," by Captain R. C. Adams.
3. "Some of the Agricultural Products of Canada," by Prof. Wm. Saunders, director of Dominion experimental farms.
4. "Wheat, and Canada's Relation to the Wheat Supply of the World," by Edgar Judge, Esquire.
5. "The Remedy for the Scarcity of Wood in the Old Settlements, and the Care of Growing Trees," by the Hon. H. G. Joly de Lotbinière.

6. "Our Native Mammals of Economic Value," by Dr. Robert Bell, of the Geological Survey.
7. "Canada's Fish and Fisheries," by Prof. E. E. Prince, of the Department of Fisheries, etc.

The gentlemen whose names now follow are the present officers and members of the council of the society:

Patron—His Excellency Lord Aberdeen.

Honorary President—Sir J. William Dawson, C.M.G., LL.D., F.R.S., F.R.S.C.

President—Dr. T. Wesley Mills.

First Vice-President—John S. Shearer.

Vice-Presidents—Hon. Edward Murphy, J. H. R. Molson, Sir Donald A. Smith, Dr. B. J. Harrington, Rev. Dr. R. Campbell, George Sumner, Edgar Judge, J. H. Joseph, Mr. Justice Würtele.

Recording Secretary—R. W. McLachlan.

Corresponding Secretary—Dr. J. W. Stirling.

Treasurer—F. W. Richards.

Curator—E. D. Wintle.

Members of Council—Frank D. Adams, Albert Holden, L. A. H. Latour, N. N. Evans, James Gardner, Joseph Fortier, Hon. J. K. Ward, A. F. Winn, S. Stevenson Brown.

Chairman of Council—George Sumner.

Superintendent—Alfred Griffin.

Before concluding, the society offers its thanks to the Royal Society for the volumes containing its proceedings and papers.

The society then adjourned until 2.30 p.m. the same day, for the purpose of organizing the sections and reading papers.

SESSION II. (May 15th.)

The Royal Society reassembled at 2.30 p.m., the president in the chair.

On motion of Dr. Stewart, seconded by Dr. S. E. Dawson, the rule respecting the election of Fellows was suspended, and Mr. Archibald Lampman was elected a Fellow of the society on the unanimous recommendation of the second section.

The following reports of delegates of associated societies were then presented:

X.—From *The Wentworth Historical Society*, through Senator D. MacInnes.

The executive council of the Wentworth Historical Society have the honour to report as follows:

The annual meeting, held on the usual anniversary, June 6th, 1894, was largely attended by members, the ladies especially evincing by the numbers present their deep interest in the society's work.

The officers' reports were presented, and the following were elected office-bearers for the year :

President—Geo. H. Mills, Esq.

First Vice-President—F. W. Fearman, Esq.

Second Vice-President—His Honour Judge Muir.

Secretary-Treasurer—J. H. Land, Esq.

Corresponding Secretary—Justus A. Griffin.

Executive Council—Hon. D. MacInnes, Hugh C. Baker, Adam Brown, Hon. J. M. Gibson, Warren F. Burton, J. W. Jones, LL.B., Major McLaren, Alex. McKay, M.P., Rev. E. J. Fessenden, John Pottinger.

This society begs to express its obligation to the Royal Society for copies of the Proceedings of 1893, and to Dr. Bourinot and others for valuable and interesting documents and publications.

As a result of the application of this society to the county council of the county of Wentworth, that body offered a prize of $100 to be awarded for the best essay on the history of the county. W. H. Ballard, Alex. Pirie and Thos. Stock, Esquires, were appointed judges.

The Dominion government having placed a sum in the estimates for the erection of a monument on the several battle-grounds of the war of 1812-14, this society at once selected a site on the Stoney Creek battle-ground, and succeeded in securing a commanding spot on the road leading to Stoney Creek, past which an electric road now runs, rendering access easy.

In response to a request from this society, the city council granted a site for the erection of a memorial on Burlington Heights, near the old battery constructed by General Vincent, now set apart as a park and appropriately named "Harvey Park," in honour of the hero of Stoney Creek.

This society has also determined upon the erection therein of a rustic building as a repository for its relics and valuable documents. The construction of this building will be in the hands of the lady members of the society, and will probably be commenced this autumn.

The society has pleasure in reporting that the legislative assembly of Ontario, at its recent session, set apart $100 as a grant to aid in extending the work and publishing a second volume of this society's proceedings.

Senator MacInnes, after reading the report of the Wentworth Historical Society, asked permission to supplement the report in making a few remarks on the important historical events alluded to in the report.

One of the objects which the society has had in view is to create an interest in the history of Canada. That a greater interest has been awakened is evidenced by the fact that kindred associations are now formed. The Canadian Club, composed of the rising young men of the community, is very active in disseminating information by frequent lec-

tures and the reading of papers concerning the history of Canada, especially Upper Canada, now the province of Ontario.

The battle of Stoney Creek was one of the most decisive battles of the war of 1812-14. The victory achieved was the means of saving the whole of the Niagara peninsula from falling into the hands of the enemy, and led to his demoralization and expulsion from the country. The attack was planned by Colonel Harvey, afterwards Sir John Harvey, who was then General Vincent's chief of staff. General Vincent's force, numerically much inferior to that of the enemy, was encamped at Burlington Heights. The American forces, marching from Fort Niagara to attack General Vincent, rested for the night at Stoney Creek, about eight miles east of Burlington Heights. Colonel Harvey, with a comparatively small force, marched to the attack from Burlington Heights about 11 o'clock at night, reaching the enemy about 2 in the morning, commencing the attack with the bayonet. The victory was complete.

The society is now making exertions for the erection of a monument to commemorate this heroic achievement, as well as a memorial to be placed at General Vincent's encampment on Burlington Heights.

XI.—From *The Ottawa Field-Naturalists' Club*, through Mr. Frank T. Shutt.

The council of the Ottawa Field-Naturalists' Club has the honour to present the following brief report to the Royal Society respecting the work and progress of the club during the past year.

It is exceedingly gratifying to be able to record that the season for 1894-5 was perhaps the most successful and prosperous in the club's history. The attendance at the evening lectures during the winter, as well as at the summer field-days, has been eminently satisfactory and encouraging.

At the meeting held in March of this year the membership roll showed 233 persons in good standing. This, however, does not represent our present number, as since that date not a few members have been enrolled. We have lost by death three members during 1895—Mr. Scott Barlow, chief draughtsman and cartographist to the Geological Survey of Canada; Mr. P. H. LeRossignol, B.Ap.Sc., assistant chemist, central experimental farm, and Mr. H. R. Moore, B.A.

The winter programme of lectures given during the past season was as follows:

Programme for Winter Season 1894-95.

Dec. 6th, 1894—Microscopical Soirée.

Inaugural Remarks, Dr. G. M. Dawson, F.R.S.; "A Grain of Wheat," W. Saunders, F.R.S.C., director Dominion experimental farms; "Microscopic Structures in Young Fishes," etc., E. E. Prince, B.A., F.L.S., com-

missioner of fisheries. Microscopes and slides were kindly furnished by Messrs. J. F. Whiteaves, W. Scott, G. M. Dawson, W. S. Odell, F. T. Shutt, A. Halkett, T. C. Weston, D. B. Dowling, W. Saunders, E. E. Prince, W. F. Ferrier, R. W. Ells and H. M. Ami.

Dec. 20th, 1894—Geology.

1, "How Rocks are Formed," Dr. R. W. Ells, F.R.S.C.; 2, "Crystals" (illustrated by models), W. F. Ferrier, B.A.Sc.; 3, Report of the Geological Branch, Dr. H. M. Ami; 4, "On the Shumardia Limestones of Lévis, Que.," T. C. Weston, F.G.S.A.; 5, "Description of a new Caddisfly (*Phryganea ejecta*) from the Pleistocene clays of Green's Creek," Prof. S. H. Scudder.

Jan. 17th, 1895—Botany.

1, "Flowering of Plants," Mr. R. B. Whyte; 2, "The Growth and Development of Fruit," Mr. J. Craig.

Jan. 31st—Conchology.

1, "The Present Condition of Canadian Conchology," Rev. G. W. Taylor, F.R.S.C.; 2, "How Shells Grow," F. R. Latchford, B.A.; 3, "How to Collect Shells," Prof. J. Macoun, F.L.S.; 4, Report of the Conchological Section, Mr. J. Fletcher, F.L.S.

Feb. 14th, 1895—Entomology.

1, "How Insects Grow," Mr. J. Fletcher, F.L.S.; 2, "Some Insect Works," Mr. W. H. Harrington, F.R.S.C.; 3, Report of the Entomological Branch, Mr. J. Fletcher, F.L.S.; 4, "Notice of a Monograph on Canadian Spiders by Emerton," Dr. H. M. Ami.

Feb. 28th, 1895—Zoology.

"On some Protective Peculiarities in Young Animals," Prof. E. E. Prince, B.A., F.L.S. (Illustrated lecture.)

March 14th, 1895—Ornithology.

1, "Town Birds," Mr. W. A. D. Lees; 2, "How to Study Bird Life," Prof. Macoun, M.A.; 3, "Feathers," Mr. A. G. Kingston.

A special feature in connection with the above lectures was that specimens, microscopic slides or lantern views were in every case used to illustrate the subject under discussion.

Three general excursions or field-days were held in the summer of 1894. The attendance and the interest evinced in the practical study of natural history on these occasions assured the council that these opportunities were highly appreciated not only by members but by Ottawa

citizens generally. The places visited were Chelsea, Wakefield and Galetta—all interesting localities for students of natural history. As in past years, the excursions were largely patronized by normal school students, to whom the privileges of the club are always extended.

Much good work of a practical character in the various branches of natural history is being done by a number of our members.

The following are the officers for the ensuing year :

Patron—The Right Honourable the Earl of Aberdeen, governor-general of Canada.

President—Frank T. Shutt, M.A., F.I.C.

Vice-Presidents—A. G. Kingston, Esq. ; H. M. Ami, M.A., D.Sc., F.G.S.

Secretary—Andrew Halkett, Esq.

Treasurer—D. R. Dowling, B.A.Sc.

Librarian—S. B. Sinclair, M.A.

Committee—Prof. E. E. Prince, B.A., F.L.S. ; J. Fletcher, F.L.S., F.R.S.C. ; W. F. Ferrier, B.A.Sc., F.G.S. ; Miss A. Shenick, B.Sc. ; Miss G. Harmer ; Miss A. M. Living.

Standing Committees of Council.

Publishing—Dr. Ami, Prof. Prince, Mr. Dowling, Mr. Kingston, Mr. Ferrier.

Excursions—Mr. Kingston, Mr. Dowling, Dr. Ami, Miss Shenick, Miss Living.

Soirées—Prof. Prince, Mr. Sinclair, Mr. Fletcher, Mr. Halkett.

Leaders.

Geology—Dr. Ells, Mr. Ferrier, Dr. Ami.

Botany—Mr. Whyte, Prof. Macoun, Mr. Craig.

Entomology—Mr. Fletcher, Mr. Harrington, Mr. MacLaughlin.

Conchology—Mr. Latchford, Mr. Halkett, Mr. O'Brien.

Ornithology—Mr. Kingston, Mr. Harmer, Mr. Lees.

Zoology—Prof. Prince, Mr. Whiteaves, Mr. Small.

"The Ottawa Naturalist" for 1894-95 comprises a volume of 162 pages. This monthly publication is the official organ of the society. In it are printed the principal lectures delivered before the club. It also contains special papers on scientific subjects contributed to other learned societies, as well as notes of general interest on matters relating to natural history in Canada. The first issue of the new series appeared on the 1st April, 1895. The dress and general appearance of the journal have been materially changed, and several other improvements respecting its publication have been made. Its circulation, which we confidently expect to increase in the near future, now numbers about 400.

In conclusion, we beg to report the finances of the society to be in a satisfactory condition. In this connection, it is worthy of remark that no government or other aid is received by the club.

XII. – From *The Montreal Microscopical Society*, through Dr. GIRDWOOD.

This society held meetings on the following dates, when papers as below were read :

Oct. 8—The Presidential Address—"The Microscope in Diagnosing and Preventing the Spread of Disease," G. P. Girdwood, M.D., M.R.C.S.Eng., F.R.S.C.

Nov. 12—"The Eye in the Lower Animals," W. M. E. Deeks, Esq., lecturer on zoology, McGill College.

Dec. 10—"The Use of the Microscope in Water Analysis," Wyatt G. Johnston, Esq., M.D.C.M.

Jan. 14—"The Pictou Cattle Disease," Prof. J. G. Adami, Esq., M.D., professor of pathology, McGill University.

Feb. 11—"The Faulted Eye," J. W. Stirling, Esq., M.D.Edin.

March 11—"Microscopical Structure of the Human Organ of Sight," J. B. McConnell, Esq., M.D.C.M.

April 8—"Some Curious Contrivances," C. T. Williams, Esq.

May 13—"Microscopy of the Internal Ear," A. Arthman Bruère, Esq., M.D.Edin.

These meetings were well attended, and interesting discussions followed the reading of the papers. The society, this past year, affiliated with the Natural History Society, so that all members of the Natural History Society, whether members or not of the Microscopical Society, were admitted to the meetings and invited to take part in the discussions of the Microscopical Society. The society has to report a membership of sixty-five in number, with no debt, and a balance of $200 in the hands of its treasurer.

XIII.—From *The Entomological Society of Ontario*, through the Rev. THOMAS W. FYLES, F.L.S.

I respectfully beg to state that the society I have the honour to serve on this important occasion is in a healthy and growing condition—sound financially, possessing a large amount of *matériel*, and held in estimation at home and abroad.

It is to be expected that the subject of economic entomology will commend itself, more and more, amongst the intelligent members of a fruit-growing and agricultural community. The insect enemies of the farmer and gardener are numerous and persevering, and accomplish incalculable harm ; and a society that studies the life-histories of these foes, and searches for checks upon their efforts, can hardly fail to win adherents and to command support.

Accordingly, we find that at the thirty-second annual meeting of our society the council was able to congratulate the members upon "the steady increase in numbers which continued to take place, and the hearty interest that was maintained in the various departments of the society's work."

The headquarters of the association are in London, the chief town of one of the most important agricultural and horticultural sections of Ontario, and a fitting centre for a society which is aided by the Ontario government, and intended to promulgate practical information amongst the cultivators of the soil, as well as to foster scientific research. The governmental grant made to the society annually is $1,000.

That the society is doing the work expected from it, and doing it well, may be proved on sufficient testimony. Thus, Mr. L. O. Howard, chief entomologist of the department of agriculture, Washington, says of it: "The society has conscientiously complied with the conditions of the grant. Its reports, published annually, have greatly increased in size and in the general interest of their contents. They have contained much matter of economic value as well as of educational interest." And the editor of an English magazine speaks of the report last issued as one of more interest to him than all others received from America.[1]

Doubtless the society with a larger grant could accomplish more good.

The meeting to which I have referred was held on the 7th and 8th days of November last. The value of the addresses given and of the papers read, and the beauty and rarity of the specimens exhibited on this occasion, were fully appreciated by those who were privileged to attend. The president's address was particularly valuable as an instructive sketch, historical and geographical, of the society and its work. It was learned from it that the society has observers and correspondents, from east to west, throughout this vast Dominion—from St. John, N.B., and Halifax, N.S., to Esquimalt, in British Columbia, and Masset, in Queen Charlotte Islands. A very valuable paper on the *Rhopalocera* of the eastern provinces of Canada was read on this occasion by the Rev. Dr. Bethune, editor of "The Canadian Entomologist." It gave a complete list of species and the names of the places in which each local kind has been taken, with, as far as known, the food-plants of the different kinds. The titles of the other papers read at the meeting are as follows:

"Insects collected in Bermuda during the Winter of 1894," by Gamble Geddes, Toronto.

"Common Names for Butterflies—Shall we have Them?" by H. H. Lyman, Montreal.

"The Pitcher Plant Moth," by James Fletcher, Ottawa.

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[1] "Entomological Record," August 15, 1894.

"*Catastega aceriella*, Clemens,=*Semasia Signatana*, Clemens," by Rev. Thomas W. Fyles, South Quebec.

"Notes on a few Canadian *Coleoptera*," by W. Hague Harrington, F.R.S.C., Ottawa.

"Food, Feeders, and Fed," by Rev. Thomas W. Fyles, South Quebec.

"An Attack of *Ephestia interpunctella*," by H. A. Stevenson, London.

"The Economic Value of Parasitism," by F. M. Webster.

"The Reappearance of *Pieris protodice*, Boisd.," by J. Alston Moffat, London, Ont.

"Remarks on the Structure of the Undeveloped Wings of the *Saturniidæ*," by J. Alston Moffat.

"Bordeaux Mixture as a Deterrent against Flea Beetles," by L. R. Jones, Burlington, Vermont.

"The Gypsy Moth," by James Fletcher, Ottawa.

"The San José Scale," by James Fletcher, Ottawa.

"Injurious Fruit Insects of the Year 1894," by James Fletcher, Ottawa.

The twenty-fifth annual report issued by the society contains portraits of Professor William Saunders, F.R.S.C., president of the society from 1875 to 1886, and Augustus Radcliffe Grote, M.A., one of the society's honorary members, and it is illustrated with sixty figures of insects. Besides the president's address and the papers above mentioned, the report contains :

The minutes of the meeting.

The report of the librarian and curator, Mr. J. Alston Moffat.

The report of the Montreal branch, presented by Mr. H. H. Lyman, president, and signed by Mr. A. F. Winn, secretary.

The report of the geological section, presented by Dr. S. Woolverton, vice-chairman.

The report of the botanical section, presented by W. F. McClement, secretary.

The report of the delegate to the Royal Society of Canada.

It also contains a very valuable abstract of the proceedings of the sixth annual meeting of the Association of Economic Entomologists, supplied by Mr. L. O. Howard, entomologist of the department of agriculture, Washington, and Mr. C. L. Marlatt, secretary of the meeting.

Also a number of interesting notices, critical, biographical, etc.

The annual report is distributed "not only to our own members, but to every member of the Fruit-growers' Association, to members of parliament, the mechanics' institutes, etc., making an issue of 6,000 copies." (W. H. Harrington, "Canadian Entomologist," vol. xxvi., p. 2.)

The society's library now numbers 1,361 volumes, 77 having been added in the course of the year.

Important additions have been made to the society's collections of insects. In its cabinets may now be seen representatives of 1,077 species duly classified and named.

The society is fortunate in retaining the services of Mr. J. Alston Moffat as librarian and curator. By his methodical habits, his skill in setting up specimens, and his extensive knowledge of the *Lepidoptera*, Mr. Moffat is peculiarly fitted for the position he holds.

During the year the various sections of the society have held field-days at St. Mary's, Dorchester, Kilworth, Byron, Komoka, Kettle Point (Lake Huron), Ilderton, Thedford, Beechville, Woodstock, Mud Lake and other places. The value of such expeditions from an educational point of view, in a neighbourhood that possesses such experienced scientific guides and instructors as Messrs. W. E. Saunders, J. M. Denton, J. A. Balkwill, J. W. Dearness, J. H. Bowman, Dr. S. Woolverton and R. W. Rennie, all long connected with the society, besides younger and enthusiastic men, is beyond estimation.

"The Canadian Entomologist," the society's monthly magazine, has reached its twenty-seventh year. The volume for 1894 contains articles from 61 contributors—14 residing in Canada, 40 in the United States, 5 in England, 1 in Germany and 1 in Sweden. In its pages are described no less than 7 new genera and 95 new species of insects. The magazine continues under the able management of the Rev. C. J. S. Bethune, D.C.L., F.R.S.C., etc. And it is a striking proof of the courage and perseverance of its editor, that notwithstanding the cares and anxieties that must have thronged him, through the destruction by fire of his noble school buildings and the beautiful chapel attached to them, "The Canadian Entomologist" has made its appearance as regularly as ever and as carefully edited.

Hitherto the Entomological Society of Ontario has studied the life-histories of insects; the methods of attack of the pests of the homestead, the storehouse, the garden, the orchard, the field and the forest; the ways for circumventing these foes; and the nature and modes of application of insecticides. Much, no doubt, remains to be learned on all these subjects. But the attention of naturalists has of late been drawn to a new and most important matter. It is—to use the heading of one of the papers published in the society's report—*the economic value of parasitism.* It is well to know how to meet enemies ourselves, but it is better, sometimes, to know how to direct faithful allies against them. If the parasite (*Diplosis grassator*, Fyles) which keeps down the numbers of the Phylloxera in this country had been carried over to Europe it would doubtless have saved many a vineyard that has disappeared. The introduction of the Australian Lady-bird (*Vedalia cardinalis*, Mulsant), the foe of the "Fluted Scale," has probably saved the orange-groves of California from extinction. The predaceous beetle, *Clerus*

jormicarius, Linnæus, has lately been introduced into New England as a check upon the "Borers," that have wrought such destruction in the spruce forests of that country. And this bringing about of good by the directing of insect agents is only in its beginning. As our knowledge increases, we shall, in all probability, be able to gather and control forces that, at present, are but little understood.

The following are the officers of the society for 1895 :

President—W. H. Harrington, Ottawa.

Vice-President—J. W. Dearness, London.

Secretary—W. E. Saunders, London.

Treasurer—J. A. Balkwill, London.

Directors : Division No. 1—James Fletcher, Ottawa.
" " No. 2—Rev. C. J. S. Bethune, Port Hope,
" " No. 3—Gamble Geddes, Toronto.
" " No. 4—A. H. Kilman, Ridgeway.
" " No. 5—R. W. Rennie, London.

Librarian and Curator—J. A. Moffat, London.

Auditors—J. H. Bowman and J. M. Denton, London.

Editor of "The Canadian Entomologist"—Rev. C. J. S. Bethune, Port Hope.

Editing Committee—J. Fletcher, Ottawa ; H. H. Lyman, Montreal ; Rev. T. W. Fyles, South Quebec ; J. M. Denton, London ; J. H. Bowman, London.

Delegate to the Royal Society—Rev. T. W. Fyles, South Quebec.

Committee on Field-Days—Dr. Woolverton, Messrs. McClement, Elliot and Stevenson, London.

XIV.—From *The Astronomical and Physical Society of Toronto*, through Mr. G. E. Lumsden.

The fifth annual meeting of the society was held in the society's rooms, No. 19 McGill street, Toronto, on January 8th, 1895, when the following officers were elected for the ensuing year :

Hon. President—Hon. G. W. Ross, LL.D., Minister of Education.

President—Larratt W. Smith, D.C.L., Q.C.

Vice-Presidents—E. A. Meredith, LL.D. ; J. A. Paterson, M.A.

Treasurer—James Todhunter.

Corresponding Secretary—G. E. Lumsden.

Recording Secretary—Chas. P. Sparling.

Assistant Secretary and Editor—Thos. Lindsay.

Librarian—Geo. G. Pursey.

Librarian's Assistants—Miss Jeane Pursey, Miss Bambridge.

Foreign Correspondent—John A. Copland.

Members of Council—The officers of the society, together with C. A. Chant, B.A., D. J. Howell, A. Harvey, F.R.S.C., R. F. Stupart and the Rev. C. H. Shortt, M.A.

The membership of the society is as follows: 13 honorary, 18 corresponding, 100 active and 19 associate members.

The objects of the society are: (*a*) To encourage, advance and popularize the study of astronomy and physics, and to diffuse as widely as is practicable, information in these branches of science; (*b*) to publish from time to time the results of the work of the society in the form of Transactions, and (*c*) to acquire and maintain a library and such apparatus as may be necessary for the carrying out of the objects of the society.

The society is indebted to several scientific institutions which have made large and valuable donations to the library. In addition to the catalogue of books, monographs, etc., a bibliography to which the public will have access, is being prepared by the librarian and his assistants. This will be of the utmost value to those interested in research on special subjects. The resources of the society are moderate, being limited to the income from membership fees, and an annual grant of $200 from the Ontario government.

In October, 1894, the society suffered a severe loss in the death of Mr. Charles Carpmael, M.A., F.R.A.S., who had been president since the date of its incorporation, and who had rendered every assistance possible while the state of his health permitted, in co-operation with the members in their work.

During the year 1894 there were held 26 regular fortnightly meetings. The attendance was invariably large, averaging one-third of the total resident active members. In addition to the regular meetings, several of the members specially interested in telescopic work met on favourable evenings at the residence of Mr. John A. Paterson, when valuable use was made of the "Wilson Memorial" telescope. This instrument is a six-inch metallic reflector, equatorially mounted, and was presented to the society by Lady Wilson, widow of Chief Justice Sir Adam Wilson, who prior to his decease in 1892, was a life member of the society, and was most actively interested in its work, especially in so far as it related to popularizing the study of astronomy.

The following papers were read before the society during 1894, and published in full or in abstract in vol. v. of its Transactions:

"On the Planet Jupiter," by Mr. W. B. Musson, dealing with ancient ideas regarding the planet and its connection with the Jupiter of mythology.

"On the Density of Jupiter," by Mr. Thomas Lindsay, who held that the constitution of Jupiter must differ greatly from that of the earth, or if the same elements compose Jupiter, that they must exist in greatly

different proportions. It was pointed out that the planet must have been, according to the nebular hypothesis, of about the same density as the parent nebula when the ring was thrown off; that the mass of the planet was about the one-thousandth of that of the nebula, and yet, in the process of condensation, the large and the small mass have kept even pace.

"Auroral Displays" formed the subject of a paper by Mr. John A. Copland, minute descriptions being given of these phenomena, and also of disturbances noted at the telegraph wires during the occurrence of aurorae.

The "Form of the Aurora" was discussed by Mr. J. Van Sommer, who reached the conclusion that the crown of the aurora follows a circle round the North pole, as it is never seen edgeways as if facing east or west.

A lecture on "Colour" was given by Mr. G. F. Hull, B.A., in the lecture room of the Physical Department of the University of Toronto. This was the second of a series of popular lectures, illustrated by experiments, to which the public were invited. The apparatus of the department was kindly placed at the service of the society by Professor Loudon, F.R.S.C. Mr. Hull dealt lucidly with the notion of "the three primary colours," and pointed out that, objectively, this was certainly a misconception, though subjectively, it might possibly be right.

"Magnetic Stress" was the subject of a paper by Mr. J. R. Collins, who introduced several experiments to prove that for short distances magnetism varied directly as the distance: Mr. Collins presented also several photographs of the magnetic lines of force, made by simply sprinkling iron filings upon sensitized paper covering a magnet, and then bringing the apparatus into the light.

Two papers on "Meteorology" were read by Mr. A. Elvins, who also reported having made observations of the spectrum of the lightning flash during a thunderstorm on the night of September 2nd, 1894. The unlooked for result was noted of the entire absence of bright lines; the flash was seen in the spectroscope 40 times, and the spectrum was invariably continuous, from the extreme red to the extreme violet. Publication of Mr. Elvins's papers was deferred, it being his intention in the near future to group together in one general view the results of several years' observation, together with a discussion of the various theories accounting for meteorological changes. It may be mentioned here, however, that Mr. Elvins has shown, referring to the subject of rainfall at Toronto, that there was an annual decrease between 1840 and 1870, while since the latter date there has been an average annual increase. This was held to be conclusive evidence that the cutting down of the forests is not, in Canada at least, the prime factor in the fluctuations of the rainfall curve.

A meteorological paper on the "Development and Progress of Areas of Depression," was read by Mr. R. F. Stupart, discussing chiefly the climatic conditions of the Northwest Territories.

Mr. Arthur Harvey, F. R. S. C., presented a paper on the "South Polar Regions in Mars," reviewing at some length the literature on our own Antarctic regions and pointing out a line of study which might prove profitable in the endeavour to trace the causes leading to the conditions prevailing on both planets. Mr. Harvey, at the various meetings throughout the year, also read, by request, short notes upon work being done at several leading scientific institutions in Europe and America, thus keeping the society in touch with current scientific thought and experimentation.

A paper on "Fallacies in Mathematics and Astronomy" was read by Mr. Thos. Lindsay.

The "Nebular Hypothesis of La Place" was reviewed at some length by Mr. J. Phillips. A translation of that part of the "Mécanique Céleste" dealing with the subject was presented for the purpose of removing several popular fallacies as to La Place's theory.

A paper on the "Transit of Mercury" was read by Mr. Thos. Lindsay, who had made the calculations to determine the instant of ingress and egress for Toronto. On the occasion of the transit, November 10th, all the telescopes available by the members were successfully used in observing the phenomenon, the most important astronomical event of the year. Several telescopes were also placed at the service of the pupils of the various public schools to enable as many as possible to have at least a glimpse of the planet on the sun's disc. Preparations had been made at the Toronto observatory and at several private residences for the accurate observing of the ingress, but for some minutes before and after the predicted time the sky was overcast, and it was a matter of regret that no observer in Toronto was able to report the moment of first external or internal contact.

Mr. A. F. Miller, at his 4-inch refractor, made micrometric measures. A bright halo around the planet was observed by Mr. G. E. Lumsden with his 10-in. reflector, and also by several members who observed with the Wilson telescope. Correspondents of the society were most successful in observing the contact; reports were received from Dr. J. C. Donaldson, of Fergus, Ont., and from Mr. J. Connon, of Elora, who presented several photographs taken during the transit. Mr. F. L. Blake, chief observer at the observatory, noted the meridian transit of the planet while upon the disc of the sun. His result was a correction to the tabulated place in R. A. of + 0·174 sec., the mean of 9 wires on each limb being taken. The very general popular interest taken on this occasion was exceedingly gratifying to the society, as it showed to what extent its objects were being attained.

The "Construction of Reflecting Telescopes" was the subject of a paper by Mr. Z. M. Collins, who, with his brother, Mr. J. R. Collins, had been very successful in the making of silver-on-glass specula. Their instruments had been tested in actual work, and had proved to be of very high excellence. The method of mounting the mirror adopted by Messrs. Collins is original and obviates the necessity of using very thick glass in its construction; the strain is evenly distributed, so that the flexure becomes nil in all positions of the telescope. The making of specula larger than eight inches in diameter has not yet been undertaken, but it is understood an order has been received for a ten-inch mirror. The society has encouraged the Messrs. Collins to continue their work with a view to the construction of a very large speculum which might be mounted in Toronto, should a popular observatory ever be erected in the city or vicinity. A committee has been appointed to consider what steps might be taken in regard to the equipment of an observatory which would be more especially for popular observation than for strict scientific work. A report will shortly be presented.

Short papers on "Sun-spot Phenomena" have from time to time been presented by Mr. G. G. Pursey, who for some years past has kept a record of the daily appearance of the solar disc. Micrometer measures have been made by Mr. A. F. Miller on all occasions when the spots have been of large dimensions. Drawings of the solar prominences, as seen in the spectroscope, have also been presented by Mr. Miller on occasions when the flames were of unusual height or of fantastic forms.

Double-star observations have engaged the attention of J. C. Donaldson, LL.D., of Fergus, who is at present preparing a list of objects of this class within the light-grasp of a first-class 3½-inch refractor.

"The Progress of Astronomy during the Year 1894" was the subject of the annual address delivered by Mr. John A. Paterson, M.A., vice-president.

Some valuable papers were contributed to the society by distinguished astronomers who are honorary and corresponding members.

J. Morrison, M.A., Ph.D., of Washington, D.C., forwarded an exhaustive monograph on "Planetary Perturbations," having special reference to the Saturnian system, and based upon observations of the satellite Hyperion. An historical essay, most valuable as an article of reference, was also presented by Dr. Morrison, dealing with the efforts, from the earliest times to the present, made by astronomers to determine the value of the solar parallax.

James E. Keeler, D.Sc., of Allegheny, Pa., contributed a valuable paper on the "Adaptation of the Refracting Telescope for Photographic Observations with the Spectroscope."

"Spectroscopic Binary Stars" was the subject of an interesting paper by Mr. J. E. Gore, F.R.A.S., of Ballysodare, Ireland.

A note on the "Jovian Comet Family" was received from Mr. W. F. Denning, F.R.A.S., of Bristol, England. A list of the more prominent members of this class was appended, with the dates of perihelion passages and next returns.

Mr. S. E. Peal, F.R.G.S., of Sibsagar, India, who has been for many years interested in selenography, contributed a paper on the markings seen in Prof. Weinek's enlargements of the Lick photographs of the moon.

In May, 1894, the late president, Mr. Charles Carpmael, communicated to the society some memoranda bearing upon the cable records of earth-currents and their connection with magnetic disturbances. Records obtained at St. Pierre, Miquelon, had been forwarded by Mr. Otto J. Klotz, of the department of the interior, who suggested systematic observation and comparison. Mr. Carpmael's communication, the last which the society received from its distinguished president, was immediately acted upon, and a committee was appointed to investigate generally earth-current phenomena and their connection, if such existed, with magnetic disturbances, auroral displays, and the phenomena presented by the sun's surface. A circular letter was addressed to the various cable and telegraph companies, asking whether they would be willing to co-operate in the work and furnish records of earth-currents. A favourable reply was received from Mr. G. G. Ward, vice-president and general manager of the Commercial Cable Company of New York, who placed the committee in communication with Mr. S. S. Dickenson, superintendent of the company's station at Canso, N.S. Arrangements for the regular transmission of the records were completed in October, 1894, since when Mr. Dickenson has each week mailed to Toronto a card containing the record of the currents, as measured daily at 5 a.m. on three cables running in different directions. Recently the company have expressed their willingness to still further favour the committee by sending the siphon record whenever practicable. The Great Northwestern Telegraph Company also replied favourably to the committee, and have agreed that whenever desired they will furnish a wire after business hours, and the committee, supplying the millimeter or such instrument as they choose, may make use of the wire until it is again required for business. The want of a suitable instrument has caused delay in taking advantage of this liberal offer, but a friend having kindly loaned an instrument which will answer the purpose, Mr. R. F. Stupart, director of the Toronto observatory, and who is also the chairman of the committee, will apply for the use of the wire whenever the magnetic instruments at the observatory indicate a decided disturbance. Each day the mean readings of the various magnetic instruments are charted on millimetre paper, and it is proposed whenever an earth-current curve is obtained to compare it with the magnetic curves. A tabulated statement of the

earth-current readings was published in the volume of Transactions for 1894, and a full discussion of the subject will be presented when sufficient data are obtained.

During the year the subject of the unification of civil, astronomical and nautical time continued to receive the careful attention of the society. Based upon the replies from 171 answers received from astronomers, all over the world, to the question: "Is it desirable, all interests considered, that on and after the first day of January, 1901, the astronomical day should everywhere begin at mean midnight?" a joint memorial from the Canadian Institute and the Astronomical and Physical Society of Toronto was addressed to his excellency the governor-general, praying his excellency to lay the matter before her majesty's advisers with a view to such action being taken as appeared to be proper in the premises. The society has reason to believe that on the 26th of June the colonial secretary forwarded the memorial to the lords of the committee of council on education, which referred it to a special committee, which, on the 3rd of August, made a report, and that, eventually, on the 22nd of September, 1894, the foreign office issued to her majesty's representatives in the countries which publish astronomical ephemerides, viz., France, Germany, the United States, Austria, Spain, Portugal, Brazil and Mexico, a circular in which it was stated that, while the lords of the admiralty "do not consider the change necessary, they are nevertheless prepared to carry it out in 1901, provided that other nations who publish astronomical ephemerides desire the change and will take the same action." Replies have, it would appear, been received from the United States, Austro-Hungary, Spain, Brazil and Mexico, and, inferentially, from France, the sense of which seems to be that whatever action Great Britain takes will be followed by other nations, with the possible exception of the United States, which, alone, are opposed decisively to the proposition. This subject is referred to at greater length in a paper read before section three of the Royal Society.

XV.—From *The Nova Scotian Institute of Science*, through Dr. Sandford Fleming, C.M.G.

The Nova Scotian Institute of Science begs to submit to the Royal Society of Canada, through its delegate, Dr. Sandford Fleming, C.M.G., a report of its proceedings during the past session, which is the thirty-third since its foundation.

The president, Professor G. Lawson, opened the session with an address containing an interesting sketch of the early history of the institute and of its work.

The treasurer's report showed the finances to be in a healthy state, and the institute is glad to acknowledge that this is largely due to the

liberality of the provincial government, which, on being informed by the council of the desirability of illustrating in an adequate manner such papers as that of Mr. H. S. Poole on "The Geology of the Pictou Coalfields," increased the institute's annual grant from $300 to $400.

The librarian's report showed that copies of the Transactions are sent regularly to 709 scientific societies, government scientific bureaus and university and other libraries, and that exchanges, consisting of transactions and proceedings of societies, journals and other scientific publications, are received from 383 scientific institutions, embracing leading societies in all parts of the world. The large difference between these numbers is accounted for by the liberality of the institute in the distribution of its publications to institutions, such as libraries from which no return is received, 63 copies, for example, being distributed annually to Canadian societies and libraries alone. The rapid growth of the library has necessitated the removal of a considerable portion of it to temporary quarters, kindly furnished by Dalhousie college.

The institute is glad to be able to report that at the last meeting of the legislature of Nova Scotia the sum of $50,000 was voted for "a public building for museum, library, etc." It is expected that accommodation will be provided in this building for the libraries of the institute, the Nova Scotia Mining Society and other societies, as well as for the provincial museum and the legislative library; and in that case valuable collections of scientific specimens and of books will be rendered readily accessible to the public.

The following were the officers elected at the annual meeting:

President—George Lawson, Ph.B., LL.D.

Vice-Presidents—Alexander McKay, Edwin Gilpin, A.M., LL.D., F.G.S.

Treasurer—William C. Silver.

Corresponding Secretary—J. G. MacGregor, D.Sc.

Recording Secretary—Harry Piers.

Librarian—Maynard Bowman.

Other members of Council—Martin Murphy, D.Sc., C.E.; A. H. Mackay, LL.D.; John Somers, M.D.; F. W. W. Doane, C.E.; Alex. P. Reid, M.D.C.M.; William McKerron, W. L. Bishop.

The following papers have either been communicated to the institute or are expected to be communicated before the end of the session:

1.—"On the Geology and Botany of Digby Neck," by Prof. L. W. Bailey, Ph.D., F.R.S.C., Fredericton, N.B.

2.—"Notes on Globigerina Ooze and Stones obtained by Captain Trott, steamship "Minia," from the bottom of the North Atlantic at a depth of nearly three miles," by A. H. Mackay, LL.D., F.R.S.C., superintendent of education.

3.—"Notes on Concretions found in Canadian Rocks," by T. C. Weston, F.G.S.A., of the geological and natural history survey of Canada.

4.—"On the Manufacture of Steel in Nova Scotia and the Iron Ores of Nictaux, Nova Scotia," by Edwin Gilpin, Jr., LL.D., F.G.S., inspector of mines.

5.—"Geological Notes on the Nictaux Iron Fields," by A. H. Mackay, LL.D., F.R.S.C.

6.—"On some Important Scientific Problems in Horticulture," by E. E. Faville, director of the Nova Scotian school of horticulture, Wolfville.

7.—"On the Butterflies of Truro, N.S.," by Miss Lucy C. Eaton, of Truro.

8.—"On a Cheap and Effective Bicycle Track for Country Roads," by Martin Murphy, D.Sc., provincial engineer.

9.—"On Relics of the Stone Age in Nova Scotia," by Harry Piers.

10.—"A Flora of Newfoundland, Labrador, and St. Pierre-et-Miquelon," by the Rev. Arthur C. Waghorne, of Newfoundland.

11.—"Phenological Observations for 1894," by A. H. Mackay, LL.D., F.R.S.C.

12.—"Note on a Remarkable Specimen of Naturally Polished Quartz," by Watson L. Bishop, of Dartmouth.

13.—"Note on Coal Gas and Other Gases produced in Presence of Carbon at High Temperatures as Probable Sources of Argon," by Professor Lawson, Ph.D., LL.D.

14.—"On the Visibility of Mercury to the Naked Eye," by A. Cameron, principal of Yarmouth academy, N.S.

15.—"On Tidal Erosion and Depositions in Minas Basin," by Professor A. E. Coldwell, Acadia college, Wolfville.

16.—"On True Surfaces and Accurate Measurements in Machine Construction," by D. W. Robb, A.S.M.E., of Amherst.

Other papers also, the exact titles of which have not yet been furnished, are expected to be communicated at the closing meeting.

Through the courtesy of the Hon. Robert Boak, president of the legislative council of Nova Scotia, the institute has had the privilege of holding its public meetings in the legislative council chamber, which has greatly promoted their success.

Owing to unavoidable delays, the Proceedings and Transactions of last session, which will form part 4 of volume i. of the second series, have not yet been issued. It is hoped, however, that they may be ready for distribution in a few weeks. Part 1 of volume ii. will then be put in hand at once.

XVI.—From *The Elgin Historical and Scientific Institute*, through Mr. G. E. Casey, M.P.

During the past year the principal work of the members of the Elgin Historical and Scientific Institute has been confined to searches in the archives and libraries of the province and the Dominion for information relating to the early history of the county.

They have succeeded in securing the original records of the court of quarter sessions established for the district of London on the 1st of January in the year 1800.

This book has not been available to those who have heretofore undertaken to write up the history of the district. The first year's proceedings, together with all references to what is now the county of Elgin, up to the year 1809, have been included in the history of the county referred to in last report. This is now all in print, and will be ready for distribution in a few days. Several valuable additions have been made to the library and museum.

The officers of the society for the present year are as follow :

President—W. B. McKay.
Vice-President—W. Atkin.
Secretary—W. H. Murch.
Curator—J. W. Stewart.
Treasurer—J. A. Bell.
Editor—C. O. Ermatinger.

XVII.—From *The American Folk-Lore Society, Montreal Branch*, through Professor Penhallow.

At the time this society was founded, an effort was made to bring together all students of folk-lore wherever they might be found within the limits of the Dominion, and although the name chosen would seem to indicate that the society is of a strictly local nature, it has, in fact, connections in Ottawa, Toronto, Quebec and other parts of Canada, which give it a cosmopolitan character. It is hoped that, in course of time, other similar organizations may be developed in our principal centres of population.

The work of the society during the year has progressed satisfactorily, and much enthusiasm has been displayed. The membership, which has been steadily increasing from the first, now reaches the satisfactory total of eighty-seven. Nine meetings in all have been held. At these meetings, in addition to a special paper, notes are offered by members and valuable discussions are held. These papers, which prove of widest interest, are published in the journal of the American Folk-lore Society, to which this

branch has already contributed a number of papers of great interest and value. The papers read during the past year are as follow :

"April Fool's Day," Mr. Henry Mott.

"Folk-lore of Newfoundland," Dr. Patterson.

"Folk-lore," Dr. Kellogg, of Plattsburg, N. Y.

"Micmac Wonder Men," Mr. Watson Griffin.

"Folk-lore of Finger Rings," Mr. J. B. Allardyce.

"Christmas Medley," Mr. John Reade.

"Village Skeleton," Miss Fraser.

"Folk-lore of the Plants Found at Clarenceville, P. Q.," Miss C. M. Derrick.

The officers for the present year are :

Honorary President—Prof. D. P. Penhallow.

President—W. J. White.

First Vice-President—Mrs. Robert Reid.

Second Vice-President—Mr. J. Fortier.

Secretary—Miss B. L. Macdonnell.

Treasurer—K. Boissevain.

Ladies Committee—Mrs. Penhallow, Miss Saxe, Miss Derrick, Miss Fraser, Mrs. Shelton, Miss Flora Macdonnell.

XVIII.—From *Le Cercle littéraire de Montréal*, through Rev. Dr. Coussirat.

Notre cercle a dix ans. N'est-ce pas un bel âge pour une société d'amateurs? Il y a presque lieu de dire avec le poëte : *Grande ævi spatium.* Bien plus, nous avons prolongé nos jours sans trop vieillir, puisque nous ne nous répétons pas encore. Preuve en soit, les sujets abordés l'hiver dernier :

1.—Analyse d'une pièce de vers de Lamartine. Par M. Lafleur.
2.—Une journée à Tanger la Blanche. Par Mme Cornu.
3.—Le jour et la nuit. Par M. Lafleur.
4.—L'imagination. Par M. Coussirat.
5.—La morale, selon Jouffroy. Par M. Amaron.
6.—La moisson en Podole. Par Mlle Huguenin.
7 et 8.—Nos chansons populaires. Par M. Morin.
9.—A propos du cerveau humain. Par M. Lafleur.
10.—La poésie. Par M. Boissevain.
11.—Une visite à l'Alhambra. Par Mme Cornu.
12.—La question chinoise. Par M. Duclos.
13.—La source de nos connaissances. Par M. Amaron.
14.—Sully-Prud'homme. Par M. Lafleur.
15.—En Belgique. Par M. L. Herdt.
16.—Deux peintres helvètes. Par Mme Cornu.

Convaincus que l'ennui naquit un jour de l'uniformité, et que l'ennui est une sûre cause de relâchement, nous avons cette année prescrit du travail à tous les membres du cercle. Ceux qui n'osent écrire ont lu ou récité des morceaux bien choisis ; une large place a été faite à la musique ; les conversations ont alterné avec la littérature ; et, en changeant de domicile à chaque séance, nous nous sommes assurés des réunions nombreuses.

De sorte que, si nous n'avons pas produit de chefs-d'œuvre destinés à éblouir l'univers, nous avons du moins essayé de développer en nous l'amour du travail désintéressé qui élève l'âme et ennoblit l'existence par la recherche du beau, du vrai et du bien.

XIX.—From *The Literary and Scientific Society of Ottawa*, through Mr. O. J. Klotz.

It is gratifying to be able to state that the membership has increased by fifty during the year, and is now 260. However, number in membership should not be the criterion of the success or the fulfilment of the mission of a society bearing the name of "Literary and Scientific Society."

The library has had 308 volumes added, making now a total of 3,116 books on the shelves.

The receipts, including the government grant of $400 and a donation of $500 from the late Colonel Allan Gilmour, were $1,612, compared with $1,591 of the preceding year. The balance on hand is $214.41.

The following lecture course was arranged and carried out :

1.—Inaugural Address : "Some Questions of the Day," the president of the society, Mr. W. D. LeSueur.

2.—"The Deemster of Man," Mr. J. F. Waters.

3.—"Carlyle," Prof. William Clark.

4.—"Browning's Reading of Euripides," Prof. John Watson.

5.—"Champlain," Mr. Joseph Pope.

6.—"Charles Kingsley," Rev. F. B. Hodgins.

7.—"The Relation of Agriculture to the Progress of Canada," Prof. J. W. Robertson.

8.—"Creation Myths," Dr. R. W. Ells.

9.—"Celestial Mechanics, Ptolemy, Copernicus, Newton," Mr. J. C. Glashan.

The lectures were fairly well attended.

The total number of books taken out of the library was 5,582, and distributed as follows :

History and biography	267
Travel and adventures	151
Fiction	4,556
Poetry	15
Essays, etc	226
Theology	...
Geology	2
Chemistry, etc	10
Other scientific works	103
Magazines	267

Fiction has rather an abnormal preponderance, forming over eighty per cent of the volumes read. As a *quasi* public library the resources of the society are and always have been altogether too inadequate to meet the wants of the members, so that the little there is to expend annually in books is largely drawn upon by fiction.

As the initiative for the establishment of a free public library by the city has now been made, it is believed that the founding of such a library would act beneficially on the Literary and Scientific Society, inasmuch as then its library would lose its prominence and the real sphere of the society given an opportunity for emerging from seclusion. Such a society should stimulate mental activity, original thought and independent research. The library of a literary and scientific society should pertain more to that of a reference than to a circulating library, and should only be an adjunct to the vitality of the society. This vitality should manifest itself through meetings, discussions, papers and a publication, as also by informal talks, for which latter purpose a room should be available so that members may learn to know of and from each other in social converse, the benefits of which are far-reaching. There is already sufficient of original and interesting work done in Ottawa that is not published that merits being put in permanent form.

Were, say an annual volume issued, the exchanges that might be obtained thereby, with the whole literary and scientific world to draw from, would in themselves constitute a most valuable library and keep the members more in touch with the world, especially when we add the current literary and scientific journals, than a mere library can do.

With these ideas in view, together with the desire to bring into closer contact the various literary and scientific societies of the city, and also to seek the support of some of our wealthy citizens who are favourably disposed towards the advancement and increase of knowledge, a committee was appointed at the last annual meeting of the society to undertake the consummation of the scheme. That it is within the range of possibility it is scarcely necessary to state. The crux, as usual, is

money. However, there are reasons for believing that the fond hope will be realized.

With sincere regret, the society has to record the death of its benefactor, the late Colonel Allan Gilmour.

At the recent annual meeting the following officers were elected :

President—Dr. R. W. Ells.

First Vice-President—Mr. Otto J. Klotz.

Second Vice-President—Dr. Thorburn.

Secretary—Mr. W. F. Boardman.

Treasurer—Mr. W. Barrett.

Librarian—Mr. W. D. LeSueur.

Members of Council—Mr. H. B. Small, Mr. J. Ballantyne and Mr. A. McGill.

XX.—From *The Kingston Historical Society*, through Prof. NICHOLS.

The preliminary meeting for the purpose of forming an historical society in the city of Kingston was held in the senate room of Queen's University on the 27th October, 1893, when about a dozen gentlemen were present.

On the 24th November, 1893, the society was formed and denominated the Kingston Historical Society.

The objects of the society are the investigation and, as far as possible, the collection and preservation of books, documents and other objects of historical interest, the reading at the meeting of papers on historical subjects, and the publication, as far as advisable, of such documents and papers.

Papers have been presented to the society as follows :

"Condition of Europe, especially of France, at the Time of the Discovery of America," Prof. A. Shortt.

"Development of France in America," R. T. Walkem, Q.C., LL.D.

"Trade and Commerce of Kingston district during first quarter of present century," A. Shaw.

"Early Presbyterianism in this city and vicinity," Rev. S. Houston.

"Chapter in early history in primary education in Kingston," J. M. Machar, Q.C., M.A.

"An old conveyance," R. V. Rogers, Q.C., LL.D.

"Grammar School of Kingston," Rev. C. E. Cartwright.

"Fort Frontenac under the Fleur de Lis, from 1755 to 1758," Surgeon-Major Neilson.

"Early parliamentary history of Kingston," Senator M. Sullivan, M.D.

"Notes and diary of an officer of the 'Voltigeurs Canadiens" stationed at Kingston in 1813," Surgeon-Major Neilson.

"Early history of the Anglican Church in Kingston," Rev. J. K. Macmorine, M.A.

The work of the society is of peculiar interest, as its researches embrace periods the most critical and historical remains among the most valuable of Canada. Kingston, with its old block house, its stone forts, martello towers, its old wooden houses with rows of dormer windows, and its rich stores of historical documents, is peculiarly fitted for the growth of a historical society.

XXI.—From *The Natural History Society of New Brunswick*, through Mr. Samuel W. Kain.

The society has held its usual monthly meetings, at which papers have been read, and also continued its winter course of lectures for elementary instruction in natural science.

During the year our president, Dr. Geo. F. Matthew, has continued his investigation of the rocks of St. John and vicinity, and a paper which he submits to Section IV. of this society shows that he has not yet exhausted that subject.

Geological papers have also been read by Prof. L. W. Bailey, Robert Chalmers, W. D. Matthew and Charles R. Fisher. In particular, I might mention the petrographic studies of the igneous rocks of New Brunswick which have been undertaken by Mr. W. D. Matthew, and the results of which have been so interesting and valuable. Mr. Matthew is the pioneer in this line of study in the maritime provinces, and is doing good work.

Messrs. Geo. U. Hay, M. L. Fernald and W. F. Ganong have read papers before the society on botanical themes, and the interest in that subject grows in the province by the sea. Messrs. Hay and Ganong have in preparation a botanical text book and manual suitable for the maritime provinces, and it is expected that the proposed work will do much to increase the widening popularity of this science.

A complete list of the mosses of New Brunswick has been prepared by that veteran botanist, Mr. John Moser, and will be published in our next bulletin.

Prof. Ganong's paper on "Phytobiology," with suggestions for a survey of Acadian plants, has been of great value to our students, and has given a new interest to this study. A second paper by the same author will be read at our June meeting dealing with the locomotion of plants.

During the year Dr. Philip Cox has continued his work on the fishes of New Brunswick with good success, and the society now has on hand awaiting publication a valuable paper by him dealing with this important matter.

Since the death of Moses Perley (the first vice-president) no one has brought to the study of our fishes such zeal and ability as Dr. Cox, and in that neglected field he may be expected to accomplish much.

I have much pleasure in laying before the Royal Society a copy of

our twelfth bulletin, issued a few months ago. It contains matters chiefly interesting to botanists and geologists. Prof. Ganong's article on "Phytobiology," with suggestions for a survey of Acadian plants, will claim the attention of botanists for the suggestions contained therein. W. D. Matthew's article on the crystalline rocks of St. John and vicinity is a valuable addition to our knowledge of a region so full of interest to geologists. A short article by Dr. Geo. F. Matthew on the post-glacial faults at St. John and the account by the same gentleman of the outlets of the St. John River, are of some general as well as local interest.

At the monthly meetings the following papers have been read :

1894.

June 5—"Report of Delegate to Royal Society," Geo. U. Hay, M.A.
"Address on the Experimental Farms," Mr. John Craig.
"The Crystalline Rocks of St. John," W. D. Matthew.
"Notes on the Botany of the Valley of the Upper St. John," by Merrit Lyndon Fernald.

Oct. 2—"The Mosses of New Brunswick, with a description of some species," by John Moser.

Oct. 9—"Some Evidences of a Glacial Epoch," by Charles R. Fisher.

Nov. 6—"Movements of the Earth's Crust at St. John, N.B., in Post-glacial Times," by Geo. F. Matthew, D.Sc.

Nov. 13—"The Outlets of the St. John River," by Geo. F. Matthew, D.Sc.

Dec. 4—"Recent Plant Studies and Discoveries in New Brunswick," by Geo. U. Hay, M.A.

1895.

Jan. 2—"The Mountain Systems of America : a Comparative Study," by Professor L. W. Bailey, Ph.D.

Jan. 15—"Faunas of the Pre-Cambrian Rocks of Brittany," President's annual address.

Feb. 5—"Organization of Amphioxus," by Dr. Philip Cox.

March 5—"The Eskimo and His Origin," by Dr. H. Geo. Addy.

March 9—"Teredo Notes," by E. T. P. Shewen, C.E.

April 2—"Outlets of the River St. John," by Robt. Chalmers, of the Geological Survey.
"Remarks on Geology of St. John River Valley," by Prof. L. W. Bailey.
"Geological Notes," by G. F. Matthew, D.Sc.

May 7—"The Volcanic Rocks of the Maritime Provinces," by W. D. Matthew, M.A.

In the elementary course, Dr. Matthew gave four lectures on the geological history of the invertebrates ; Dr. Cox gave four lectures on the geological history and structure of the vertebrates, and Mr. W. M. McLean gave three lectures on classification.

At the thirty-third annual meeting of the Society, held Jan. 16, 1895, the following officers were elected :

President—Geo. F. Matthew, M.A., D.Sc.

Vice-Presidents—Geo. U. Hay, M.A., W. M. McLean, M.A.

Treasurer—Alfred Seely.

Secretary—Samuel W. Kain.

Librarian—P. G. Hall.

Curators—Wm. Murdock, C.E., H. Geo. Addy, M.D., and Charles R. Fisher.

Additional Members—J. Roy Campbell, LL.B., F. E. Holman and W. F. Best.

XXII.—From *The Nova Scotia Historical Society* through the Hon. J. W. Longley, M.A.

At the annual meeting held in February, 1895, the following officers were elected :

President—Hon. M. H. Richey.

Vice-Presidents—Rev. John Forrest, D.D., Hon. J. W. Longley, Hon. L. G. Power.

Corresponding Secretary—F. Blake Crofton, Esq.

Recording Secretary—Adams A. Mackay, Esq.

Treasurer—R. J. Wilson, Esq.

Council—J. J. Stewart, Esq., A. H. Mackay, Esq., LL.D., Rev. T. W. Smith, D.D., Hon. Mr. Justice Townshend.

Library Commissioners—Hon. Mr. Justice Weatherbe, Rev. Principal Forrest, Hon. M. H. Richey, A. H. Mackay, Esq.

Auditors—F. W. Bowes, Esq., W. L. Brown, Esq.

During the year fourteen members were added to the society, and twenty-two books, fifty-three pamphlets and thirty manuscripts were added to the library.

The following papers were read :

"Louisbourg : An Historical Sketch," by J. P. Edwards, Esq., of Londonderry, N.S.

"The Irish Discovery of America," by Hon. L. G. Power.

"Notes on the History of the Dockyard at Halifax," by Charles Stubbing, Esq.

"Early Military Life in Halifax," by W. H. Hill, Esq.

Mr. Edwards's paper was particularly interesting in view of the proposed celebration of the one hundred and fiftieth anniversary of the capture of Louisbourg by Pepperell and Warren, and showed careful and thorough research. The society will co-operate with the society of colonial war in the ceremonies connected with the celebration.

Two volumes are in course of publication and will shortly be issued.

"The History of the City of Halifax," by the late T. B. Akins, LL.D.

A small pamphlet on the subject was published by Dr. Akins in 1847 which is now rare. It was entirely re-written and enlarged by Dr. Akins before his death and is now being published by the society under the editorship of J. J. Stewart, Esq.

The other volume is a collection of transactions (volume ix.) and will contain:

"The Voyages and Discoveries of the Cabots," by Rev. Moses Harvey, D.D.

"A Chapter in the History of the Township of Onslow," by Israel Longworth, Esq., Q.C.

"The Life of Richard John Uniacke," by Hon. L. G. Power.

"Ships of War wrecked on the Atlantic Coast," by S. D. McDonald, Esq.

"Louisbourg: An Historical Sketch," by J. Plimsoll Edwards, Esq.

The prospects of the society are bright for an interesting and useful programme next year. Papers have already been promised by writers who have had opportunities of collecting facts relative to various phases of the early history of Nova Scotia. Under the energetic direction of the president, Hon. M. H. Richey, the activity and usefulness of the society is assured.

SESSION III. (May 15th.)

The Royal Society and delegates held a public meeting in the evening at 8 o'clock in the Assembly Hall. His Excellency the Governor-General presided as honorary president. Her Excellency, the Countess of Aberdeen, and a large audience were present.

After a few remarks by His Excellency, the president, J. McPherson LeMoine, Esq., delivered the annual address as follows:

The Manuscript Sources of Canadian History as Revealed by Our Archives.

"*Colligite Fragmenta ne pereant.*"

If family papers are cherished, claim respect in the home circle as memoirs of an unforgotten past, how much more ought to be prized, carefully garnered and preserved, the records of a whole people, that is, its public archives.

Their contents inspire an interest confined not to one family alone; they embrace society at large—the aggregate of thousands of families.

A nation's history lies in its archives; there can it be sought; there rests the enduring evidence of its existence—the authentic certificate of its origin—its title deeds—the story of its achievements, good or bad.

These records, mayhap dusty, unprepossessing, of access arduous, call forth feelings of interest whenever we meet with them; the year

part and parcel, fragments of one's country, dispersed far from home sometimes, *les lambeaux de la patrie dispersée*, as a French writer styles them.

One experiences a legitimate pride, when on wading through these old parchments or ponderous folios, one lights on brave, patriotic or warlike deeds, accounts of wise, great or good men, though seen in the obscure distance, showing that one's people is of honourable, ancient lineage, not an irresponsible mushroom community without a past, heedless of a future.

Often these crabbed, uninviting documents are scanned, appealed to, in preference to the highly wrought, tinted version of the modern historian wedded to new-fangled theories, peculiar schools of thought, bent on perverting, omitting or colouring facts, so as to make them dovetail into systems of belief, ancient or modern.

Canada, like other countries, has her archives, private and public, though the patriotic duty of collecting them, at home and abroad, has of late years only seriously commended itself to public attention.

Where were our archives in the past? Where are they at present? I hear some one ask.

Until measures were taken, in 1872, to collect them, portions more or less considerable existed in London, Paris, Rouen, Madrid, Venice, Amsterdam, St. Petersburgh, Washington, Boston, Quebec, Three Rivers, Montreal, Ottawa, Kingston, Toronto.

Quebec, the citadel of French power in the new world nearly three centuries ago, as such was supplied by the French king with a complete set of public officials, from a magnificent viceroy down to a humble water bailiff, without omitting a hangman.

She necessarily became the depository of the innumerable official documents, despatches, commissions, maps, plans and correspondence, affecting the relations of the mother-country with her pet colony.

It was necessary to provide for the civil and military administration of the new dependency in every branch of the public service.

The litigious character of her Norman and Breton peasantry very soon called forth a large outfit of judicial officials, whilst her peculiar position as the key, the bulwark of French dominion in North America, required defensive works and the appointment of a military staff adequate to its defence.

For more than two hundred years, an object of jealousy to the surrounding Indian tribes, as well as a menace to the sturdy, progressive, but unwarlike British colonies beyond the border, her's became a martial record of respectable proportions. The history of her five sieges alone fills many volumes.

The art of the printer being nearly unknown at Quebec under the early régime, her chronicles had to be noted down in manuscript form for preservation or for transmission to France.

It would be too lengthy, a tedious operation in fact, to attempt furnishing a full list of the old French records of the province of Quebec.

With your permission I will confine myself to reviewing the most notable ones. Conspicuously stand forth those recently published by the Provincial Government,[1] at Quebec, by the Literary and Historical Society of Quebec,[2] by the Société Historique de Montréal.

For years these precious documents had rested unproductive, as it were, closed to the public eye, in the vaults of the Quebec parliament house and in the subterranean apartments of the court house. Montreal, too, had its old records stored in the moist vaults of its court house.

We have to note, and we do so with pleasure, the beneficent action of a previous governor, Lord Dorchester, who ordered these documents to be examined and reported on.

After the signature of the final treaty ceding Canada to England in 1763, it was deemed necessary to have an inventory made of all the old French archives. This measure interested both of the belligerent parties; the victors had agreed by capitulation, as well as by treaty, to respect the laws of the vanquished.

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[1] Documents relatifs à la Nouvelle France, 1492–1789, 7 volumes quarto.
Jugements du Conseil Supérieur, 1663–1685, 2 volumes quarto.
Montcalm et Lévis, Guerre du Canada, 1756–1760, 2 volumes quarto.
Journal du Chevalier de Lévis, 1756–1760, 1 volume quarto. 343 p.
Lettres du Chevalier de Lévis, 1756.1760, 1 volume quarto. 473 p.
Lettres de la Cour de Versailles, 1756–1760, 1 volume quarto.
Les Pièces Militaires, 1 volume quarto.
Lettres de Bourlamaque à Lévis, 1756-1760, 1 volume quarto.
Lettres de Montcalm à Bourlamaque, 1756, 1 volume quarto.
Lettres de Montcalm à Lévis, 1756, 1 volume quarto. 240 p.
Journal de Montcalm, 1756, 1 volume quarto. 626 p.
By Société Historique de Montréal, 9 series.
1e Livraison, 1859, Esclavage au Canada. 64 p.
2e Livraison, 1859, Famille Lauzon. 58 p.
3e Livraison, Ordonnance de Maisonneuve. 33 p.
4e Livraison, 1868, Histoire de Montréal. 272 p.
5e Livraison, 1870, Régime Militaire. 328 p.
6e Livraison, 1875, Dollier et Gallinée, voyage. 84 p.
7e Livraison, 1880, Peter Kalm, traduit par Marchand. 168 p.
8e Livraison, 1880, Peter Kalm, 2 vol., traduit par Marchand. 256 p.
9e Livraison, 1880, Les Véritables Motifs des Messieurs et Dames. 94 p.

[2] Historical documents published by the Quebec Literary and Historical Society, since its foundation up to 1887. First series:

1. Mémoires sur le Canada depuis 1749 jusqu'à 1760, en trois parties; avec cartes et plans lithographiés. VII. et 211 p. in-8, Québec, 1838. Ré-imprimés en 1873.

Ce mémoire a pour deuxième titre: "Mémoires du S—— de C——, contenant l'histoire du Canada durant la guerre et sous le gouvernement anglais." Il fut communiqué à la Société Littéraire et Historique par M. le colonel Christie. L'introduction donne à entendre que l'auteur du manuscrit pourrait être M. de Vauclain, officier de marine en 1759.

2. Collection de mémoires et de relations sur l'histoire ancienne du Canada,

It became urgent for the French Canadians to make known what the laws, decisions and sentences had been. Moreover, the decisions rendered by the military tribunals, which had governed the country from 1759 to 1763, were likely to have innovated in certain judicial matters. Irregularities doubtless had occurred, and the new constitution granted by the Quebec Act, in 1774, as well as other causes, had created uncertainty on some legal points; this made it of paramount importance for all parties to know how they stood.

Such the origin of the commission or committee named by His Excellency, Lord Dorchester, on the 27th December, 1786, composed of Judge Adam Mabane and Messrs. Dunn and de Léry at Quebec, and of the members of the council at Montreal, with instructions to report to the governor without delay, the actual state and condition of the old registers and records of the province of Quebec; where they were stored, etc. On the 19th June, 1788, the committee was further directed to report as to the contents of every volume, the period it covered, the number of its

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d'après des manuscrits récemment obtenus des archives et bureaux publics, en France. (8 mémoires reliés en 1 vol. (papier), in-8, Québec, 1840).

1. Mémoire sur l'état présent du Canada, attribué à M. Talon. 7 p.
2. Mémoire sur le Canada (1736), attribué à M. Hocquart. 14 p.
3. Considérations sur l'état présent du Canada (1758). 29 p.
4. Histoire du Canada par M. l'abbé de Belmont. 36 p.
5. Relation du Siège de Québec en 1759, par une religieuse de l'Hôpital Général de Québec. 24 p.
6. Jugement impartial sur les opérations militaires de la campagne en Canada en 1759. 8 p.
7. Réflexions sommaires sur le commerce qui s'est fait en Canada, 8 p.
8. Histoire de l'eau-de-vie en Canada. 29 p.

3. Voyages de découvertes au Canada entre les années 1534 et 1542, par Jacques-Cartier, le Sieur de Roberval. Jean Alphonse de Xaintonge, etc. Suivis de la description de Québec et de ses environs en 1608, et de divers extraits relativement au lieu de l'hivernement de Jacques-Cartier en 1535-36 (avec gravures *fac-similé.*) Ré-imprimé sur d'anciennes relations. 130 p. in-8, papier, Québec, 1843.

4. Mémoire du Sieur de Ramsay, commandant à Québec, au sujet de la reddition de cette ville le 18 septembre 1759, d'après un manuscrit aux archives du bureau de la Marine, à Paris. 84 et 38 p. in-8, Québec, 1861. (Dû à M. Geo. B. Faribault.) papier.

Historical Documents, 2nd series. 8-vo., paper.

Extract from a manuscript journal relating to the Siege of Quebec in 1759, kept by Colonel Malcolm Fraser. 37 p. in-8.

The Campaign of Louisbourg, 1750-58, attributed to Chevalier Johnstone. 28 p., 8 vo., Quebec, 1867.

A Dialogue in Hades, a parallel of military errors, of which the French and English armies were guilty, during the campaign of 1759 in Canada. 55 p., 8-vo., Quebec, 1866. Attributed to Chevalier Johnstone.

The campaign of 1760 in Canada. 24 p., 8-vo. A narrative attributed to Chevalier Johnstone.

The invasion of Canada in 1775. Letter attributed to Major Henry Caldwell.—1776. 19 p., 8-vo., published at Quebec, 1866.

A journal of the expedition up the River St. Lawrence, republished from the New York *Mercury* of 31st December, 1759. 19 p., 8-vo.

pages, its contents and markings, its present condition, its authenticity, the public office to which it belonged, where it was deposited, and on every other point which might affect matters previous to the conquest.

The report, seven hundred copies of which were printed in 1791, in English and in French, at the office of Neilson's old *Quebec Gazette*, is at present a rare and valued document.

This inventory showed that several important records therein mentioned were missing. If not irretrievably lost, their absence from the shelves of the public office, which at one time had owned them, was established.

I can recall visiting in my youth the damp, subterranean vaults of the old parliament house at Quebec (since destroyed by fire) and being struck by the prodigious mass of documents, bound and unbound folios, parchments and registers stored there. Some, however, were destined to escape the corroding tooth of time and decay, and one of the most zealous presidents of the Literary and Historical Society at Quebec, the late George B. Faribault had succeeded in inducing the society to have them transcribed. Others were removed to the dark cells of the Quebec court house, whilst many perished in the great fires that ravaged the city. The major part, however, one is happy to say, were safely stored, after

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Historical documents, 3rd series. Published under the auspices of the Literary and Historical Society. 1 vol., cloth 8-vo., Quebec and Montreal, 1871. Contents :

Histoire de Montréal, 1640-1672. 128 p., 8-vo. Ouvrage attribué à M. F. Dollier de Casson, S. S.

Journal des opérations de l'armée Américaine, lors de l'invasion du Canada en 1775-76, par M. J. B. Badeaux. 43 p., in-8, Montréal, 1871.

Recueil de ce qui s'est passé en Canada au sujet de la guerre, tant des anglais que des iroquois, depuis l'année 1682. 82 p., in-8, Québec, 1871.

Voyage d'Iberville. Journal du Voyage fait par deux frégates du roi, la Badine et le Marin, 1698. 48 p., in-8, Montréal, 1871.

Journal of the Siege of Quebec, 1759-60, by General Jas. Murray. 45 p., in-8., Quebec, 1871.

Historical Documents, 4th series. 1 vol., 8-vo., paper, 1875.

A journal of the expedition up the River St. Lawrence, 1759. 21 p.

General orders in Wolfe's army during the expedition up the River St. Lawrence, 1759. 56 p. (Original in the hands of J. M. LeMoine.)

Journal du siège de Québec en 1759, par Jean Claude Panet. 31 p.

Journal of the siege and blockade of Quebec by the American rebels, in autumn 1775 and winter 1776, attributed to Hugh Finlay, Postmaster-General. 25 p.

Historical Documents, 5th series. 1 vol., 8-vo., 152 p., Quebec, 1877. Containing documents relating to the war of 1812.

Historical Documents, 6th series. 1 vol., 8-vo.

Tabular statement of arrivals from sea at Quebec, during the navigation season of 1793, showing dates of sailing and arrival, nature of cargo, names of ships, masters, owners, &c., extracted from the registers of the Quebec Exchange and contributed for publication in the archives of the Literary and Historical Society, by MacPherson LeMoyne, Seigneur of Crane Island, Montmagny, province of Quebec.

Confederation, in the fireproof rooms of the provincial registrar in the new legislative building at Quebec.

Several friends of progress, since that period, the first prime-minister of the province, Hon. P. J. O. Chauveau, Hon. Gédéon Ouimet, later on the Hons. Jean Blanchet and C. E. A. Gagnon, provincial secretaries, urged on by historical societies and by ardent students of Canadian history, Francis Parkman, George Baby, Abbés Verreau, Bois, Tanguay, Casgrain and others, succeeded in inducing the legislature to vote funds to print several voluminous series of these documents in 1883 and in following years, nor ought one omit recording the hearty co-operation of the late Dr. T. B. Aikins, of Nova Scotia.

A powerful impulse had been given to the collection of public archives in this province, by the creation at Ottawa in 1872, of the archives office, an annex to the department of agriculture, in which our colleague, Mr. Douglas Brymner, has won golden opinions.

Any one conversant with the neglected state of our archives in the past, will readily admit that the era of collecting and preservation was not commenced one day too soon, though matters in this respect were not so bad in Canada as they were, until lately, in England.

Mr. Brymner, after mentioning the early legislation in England to inquire into the state of public records and to devise means to preserve them, in the reign of Edward III. (1473), in Queen Elizabeth's time (1559–1603), under James VI. (1617), George III. (1760–1820), William IV., in 1837, notes a striking contrast between the dreadful state of neglect of the English archives and those of Scotland. The records of the Queen's Remembrancer, says he, it was discovered were stuffed into 600 sacks in a most filthy state, and to disinter a document known to exist somewhere in these heaps, was a work of a most disgusting nature. The report of the committee of the House of Commons of 1836, gives the evidence of Mr. Henry Cole as to the state of the King's mews containing these records. He says: "In these sheds 4,136 cubic feet of national records were deposited in the most neglected condition. Besides the accumulated dust of centuries, all, when those operations commenced, were found to be very damp. Some were in a state of inseparable adhesion to the stone walls.

"There were numerous fragments which had only just escaped entire consumption by vermin and many were in the last stage of putrefaction. Decay and damp had rendered a large quantity so fragile as hardly to admit of being touched; others, particularly those in the form of rolls, were so coagulated together that they could not be unrolled. Six or seven perfect skeletons of rats were found imbedded, and bones of these vermin were generally distributed throughout the mass; and besides furnishing a charnel house for the dead, during the first removal of those

national records, a dog was employed in hunting the live rats which were thus disturbed from their nests." [1]

The only exception to the "shocking state" of the documents is in the case of Scotland, of the record office of which the committee spoke in these terms : "Collected together, in one central, ample, commodious and safe building in Edinburgh, placed under the custody of most competent and responsible keepers, they appear to be kept in a state of perfect arrangement and ample information supplied by full calendars and indexes."

The systematic arrangement of records, the facility of access thereto, the ample information as to contents supplied by full calendars and indexes, outlined in old Embro, one is happy to find, has guided the canny hand of her industrious son, Douglas Brymner, in the formation of our own public record office at Ottawa.

It has been previously stated that the Historical Society of Montreal, and her older sister, the Literary and Historical Society of Quebec, had repeatedly urged on successive administrations the propriety of collecting, preserving and publishing documents of an important historical character. Both associations deserve a good word, but the share of the Quebec institution in this progressive work, ever since its foundation, on the 6th January, 1824, by the Earl of Dalhousie, then governor-general of Canada, is so marked as to warrant special notice. In a circular given to the public the purposes of the society were thus declared : "To discover "and rescue from the unsparing hand of time, the records which yet "remain of the earliest history of Canada. To preserve, whilst in its "power, such documents as may be found amid the dust of yet unexplored "depositories, and which may prove important to general history and to "the particular history of the province."

A glance at its Transactions and publications will show that it has not been recreant to its trust.

The origin of the archives office at Ottawa dates back, as previously stated, to the year 1872 ; it was the outcome of the petition presented to parliament in 1871, setting forth that authors and literary inquirers were placed in a very disadvantageous position in Canada, in comparison with persons of the same class in Great Britain, France and the United States, in consequence of being practically debarred from facilities of access to the public records, documents and official papers in manuscript, illustrative of the history and progress of society in Canada, and praying that steps be taken to have the archives of Canada collected. Parliament then voted a sum for the purpose of making preliminary inquiry into the subject. Further sums have been voted from year to year.

Mr. Douglas Brymner was charged to inquire into the state of the archives in the several provinces of the Dominion.

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[1] Report of Dominion archivist, 1881. p. 6.

His voluminous report to the head of his department sums up the whole case so ably, that I cannot do better than quote a portion of it.

"I visited," says he, "Toronto, Montreal and Quebec (the two latter cities more than once), Halifax, St. John and Fredericton . . . I consider it desirable to call attention to the manner in which the records and official documents are kept. In Montreal, the vaults under the old government court house . . . . are unfit for the purpose to which they are applied. The air is damp and foul, so that it is dangerous to the health to remain in them beyond a very limited time . . . . Many of these are of much historical value; some of them could not be replaced."

"The complaint as to the dampness of the vaults in Montreal, applies also to those under the court house at Quebec."

It may be well to state that these complaints have since been effectually removed. He continues:

"In Halifax the documents in the province building are stored in a room which is not fireproof; otherwise they are well kept and in good order. . . . . "

"In 1857, on motion of the Hon. Joseph Howe, an examination of the ancient records and documents illustrative of the history and progress of society in Nova Scotia, was ordered to be made. In 1864, upwards of 200 volumes of manuscripts had been selected, arranged, catalogued and bound, and in 1865, the legislative assembly referred the matter to a committee."

It would take me far beyond the bounds to which space limits me, were I to attempt a full history of the Dominion archives since their origin. Those curious of entering deeper into the subject have ample verge and material to consult in the fifteen reports submitted on this matter to the legislature since 1872 by Mr. Brymner, by the learned Abbé Verreau in 1874, and by Mr. Joseph Marmette (Alas, no more!)

1873.—The report for this year includes an account of the Dominion archivist's visit to London, and of the records and despatches stored in the British Museum, the British public record office, the Tower of London, the war office, the office of the secretary of state, on war, fisheries, commerce, emigration, etc.

With respect to the documents stored at Montreal, he adds: "There is a collection of statutes, in French and in English, which I would respectfully recommend should be distributed to public libraries and literary institutions. They are chiefly the old 'Acts and Ordinances' and 'Edits et Ordonnances,' reference to which is frequently desired."

The legislative assembly of Halifax referred the subject of archives to a committee, who recommended the publication of a volume of public documents, to be selected by the commissioner of public records, Dr. T.

B. Aikins. That gentleman had the volume published in 1869, containing:

1. Documents relating to the Acadian French inhabitants and their removal from Nova Scotia in 1755.
2. On the encroachments of the French authorities of Canada on the territories of Nova Scotia.
3. On the siege of Fort Beauséjour in 1755 and the war on the continent terminated by the cession of Canada.
4. Papers connected with the settlement of Halifax in 1749 and the first British colonization of the province.
5. The official correspondence preparatory to the establishment of a representative form of government in 1758.

The records in possession of the military authorities at Halifax are voluminous. The earliest date is 1779, and they are continued to the present day. "General Sir Hastings Doyle," says Mr. Brymner, "gave instructions that I should have access to the papers, and Major Robertson, military secretary, saw that every facility was afforded to me to have them examined." On permission being subsequently asked from the imperial government to have this valuable collection of documents removed to Ottawa, it was granted.

Mr. Brymner's visit to St. John, N.B., in quest of old documents was not so successful.

His mission to Quebec, to wit, to examine the documents of the Quebec seminary, proved satisfactory. Mr. Brymner closes his report for 1872, with an expression of thanks to Rev. Messire Tanguay, in charge of the records, and also to the Rev. Abbé Laverdière, librarian of Laval University, for the facilities afforded the archivist in his laborious quest.

1874.—The report of the Rev. Mr. Verreau, deputed to London and Paris in 1874, throws much valuable light on documents relating to Canadian history stored in European cities. This gentleman dived into the records of the British museum, examined the Seignier collection, Harleian manuscripts, the voluminous Haldimand collection, manuscripts of George III., English state archives, the Quebec correspondence comprised in twelve volumes, containing a mass of curious and unpublished details, some bearing on Montcalm's last letters and on the chequered career of the notorious ex-Jesuit, Pierre Roubaud, in Canada and in England; the valuable collection of fifty-six volumes, entitled "Dorchester Papers." They had been presented by Mr. M. Morgan Castelow, secretary to Mr. John Seymour, who bequeathed them to the Royal Institution in 1804.

Mr. Verreau then crossed over to France, visiting the extensive archives of Lille. At Brussels, he found at the "Archives du Royaume," a volume entitled "Missions d'Amérique," containing several autograph letters, one on Canada; searching successfully for material, at the "Bibliothèque Royale," etc., there also he picked up precious information

relative to a large number of French officers, who had emigrated from Canada at the time of the conquest.

At Liège and at Metz, the archæologist found in the public libraries a few works relating to Canada.

The "Bibliothèque Nationale" in Paris, which is consulted by the learned men of every country, offered the Canadian delegate a rich mine for research, as well as the "Archives Nationales" and the *Département de la marine.* Here occur the most important and most numerous documents bearing on the territories comprised under the name of Nouvelle-France. p. 193.

At the department of foreign affairs, under the heading "Americana," in volumes i., ii., iii., iv., are found public documents of paramount interest on Canada and Acadia as early as 1629.

There also occur, marked "England," "Rome," "St. Petersburgh," manuscript volumes deeply interesting to the student of Canadian history.

1881.—Among the topics alluded to by the archivist in his report for this year, may be noted various documents on Newfoundland; on the protection of its fisheries from the inroads of the French, 1696-97; on the trade of the colony, 1705-6; on the number of vessels trading, with particulars of the annoyances and hindrances the French caused to trade. A list of the chief harbours is also given, and we find a mention of "Whiteburne's discourse on Canada," also of a vocabulary of the language of the Newfoundland Indians; a general description of the province of Nova Scotia, and a report on the state of its defences by Lieut.-Col. Moore in 1783; plans of different forts; the journal of Sir Hovenden Walker's unsuccessful attempt on Quebec in 1711.

1882.—One of the subjects to which Mr. Brymner draws attention that year, is the urgency of enlarged space for the archives rooms, in order to classify and arrange separately, for the eight provinces constituting the Dominion of Canada, the rapidly accumulating papers referring to each.

"If," says he, "lists of records of the different provinces in the possession of their respective governments were procured, they would be of the greatest use in proceeding with the work of this branch, and would assist very materially in furnishing information to historical investigators, who not unfrequently make inquiries as to the existence and plans of deposit of papers which they desire to consult."

We are next reminded by him of the wise policy of having one general collection of historical documents at the seat of the federal government, and one special at each province in its provincial capital.

"The possession of records in duplicate is a guarantee, to a large extent, of their preservation from destruction by fire; experience has shown the risk from this cause."

An ample calendar follows, of letters and papers on the siege opera-

tions at Quebec in 1759 ; plans of forts, custom house laws and proceedings, commerce.

1883.—Two interesting reports on archives were submitted to parliament this year ; one from Mr. Brymner and one from Mr. Marmette. This gentleman duly accredited by Lord Granville through the English ambassador, Lord Lyons, to the French government, congratulates himself on the facilities afforded him to examine the archives branch of the ministry of foreign affairs and the "Bibliothèque Mazarine." The papers, plans, maps and documents stored in these various offices, cover the whole French period, 1603-1759, and throw light on many obscure points in our history.

Mr. Brymner, after relating the preliminary steps in 1871 in our parliament, which led to the organization of our archives office, says that the first important contribution to it was made by the war office, which, after some negotiations conducted by him when in London in 1873, consented to transfer the Canadian military correspondence, going back nearly one hundred years, which was packed up in Halifax ready for transmission to London. These papers numbered upwards of 200,000 documents of various sizes, shapes and contents.

They are now in Ottawa, bound in 1,087 volumes. It was, of course, necessary for him to go through a deal of red-tapeism before obtaining leave to have access to and to transcribe several important state papers, as he was restricted to extend his search to documents printed prior to 1842. The report, calendar and index, are replete with useful information

I shall, however, make room for a few extracts from a striking letter addressed to Mr. Taylor, London, by T. Frederick Elliott, a nephew of Lord Minto, secretary of the Gosford commission, sent out to report on Canadian grievances in 1835, bearing date, Quebec, 24th October, 1835. This letter is mentioned thus in the Greville memoirs, vol. iii., p. 125 : "I have just seen an excellent letter from Frederick Elliott to Taylor, with a description of parties and politics in Lower Canada, which has been shown to the ministers, who think it the ablest *exposé* on those heads that has been transmitted to them." Lord Howick tells us he hopes this clever letter would be shown to Lord Glenelg, to Lord Melbourne and to the king. Mr. Elliott disposes of the opinion prevalent in some quarters to this day, that the insurrection in Lower Canada in 1837 was a mere question of race, French *versus* English ; whereas, far from being a mere rising confined to the French element, it had had for its most strenuous leaders and organizers, men of quite another race than the French ; such as Drs. Wolfred Nelson, Robert Nelson ; Scott, Tracy, T. S. Brown, O'Callaghan, Girard, Hindelang, Samuel Newcome, [1] B. Mott. The intolerable abuses of the period, the oppressive colonial misrule of the oligarchy,

[1] Samuel Newcome and Bery Mott formed part of the fifty-eight political prisoners transported in 1839 to New South Wales, and who returned after spending five years and four months in exile.

so unsparingly criticised by Lord Durham, such are the primary causes of discontent.

MR. ELLIOTT'S LETTER.

"Quebec, 24th Oct., 1835.

"MY DEAR TAYLOR,—People have been accustomed in England to hear of only two parties in Canada, the English and the French, but there are in fact three parties, the official, the English and the French, besides some important French classes altogether distinct from the party which goes by that name.

"The official, or as the French term it, Bureaucratic party, is composed of a few old men holding the highest offices. They seem to be fond of privilege, jealous of interference, and ready to hold office at any inquiry into the popular allegations. Most of them are dull, and those who are the reverse are said to be interested. It is of very little consequence what they are. Whatever influence they may have formerly exercised through the instrumentality of weak governors, they are now destitute of any of the real elements of power, having neither connections at home (England) nor weight in the province. If there be a body in the world, which may, without fear, be handled according to its merits, that is the high official party of Canada. In the province itself it is very difficult to say by which great divisions of the people it is detested the most. Very different from this feeble corps is the real 'English party.' It is composed of almost all the merchants, with an admixture of considerable landholders, and of some of the younger and more intelligent civil officers. It possesses much wealth and still more credit, and in addition to these it has all that mutual confidence and that precision and unity of purpose, which, to do our countrymen justice, they know better than any other people how to confer on political associations. This imposing body, moreover, has great advantage at the present moment in the moderation of tone which it can assume in contrast to the violence of its adversaries, thus gaining the good-will, if not the overt support, of the numerous portion of society which prefers security and a tranquil life to everything else. Yet I do not like the English party. It is fully as ambitious of dominion as the French party, and in my opinion, prepared to seek it by more unscrupulous means. Whenever either of the two at the present moment speaks of separation, I look upon it as a mere bombast or artifice to bend the course of government, but, depend upon it that if ever these heats in Lower Canada should go so far as to hazard the connection with the mother-country, the English will be the foremost to cut the tie. They, of the two parties, are by far the best disposed to sympathize with republican institutions.

"They are the most rancorous, for they remember the power they have lost, and hate their rivals as a sort of usurpers."

How singularly this letter written sixty years ago reads, especially

when one recalls the memorable utterance of the late Sir E. P. Taché, A.D.C. to the queen. "The last gun fired on Canadian soil in favour of England will be by a French Canadian." Other bits of information, as new as the last, and curious as subjects for reflection, occur in Mr. Elliott's second letter to Mr. Taylor, dated "Quebec, 12th November, 1835."

After alluding to the opening of the session and to the doubt whether, in voting the arrears of the last two years, the assembly would include repayment of the sum of £31,000, advanced to the civil servants out of the military chest, Mr. Elliott adds: "If Mr. Spring Rice himself had been there he could not have wished to hear more home truths than I delivered on the subject to two or three French members with whom I dined *en petit comité*, among whom was the editor of *Le Canadien* newspaper.

"It is astonishing how this country has been mismanaged. When I came to know the men whom the military rulers here have been accustomed to regard as little better than traitors and little wiser than children, I am surprised to find:

"1. On what friendly bases their views generally are founded, and,

"2. How much superior are their perceptions in political science to those of the men by whom they have been so arrogantly despised."

How strange Mr. Elliott's strictures seem to us in the present day, and how could a full and impartial record of the past be indited without referring to these dry-as-dust documents of another age?

Mr. Elliott's letters are followed with one addressed by the Hon. A. N. Morin to Sir Francis Hincks, dated at Quebec, 8th May, 1841, replete with politic and patriotic utterances, in which he comments on an expression of Lord Durham on the political events of the period. This clever and proud statesman is alleged to have said, through the mouth of one of his *attaches*, "That they (the oligarchy) had done enough to drive the people wild into the woods." (p. 172 of Archivist's report for 1883.)

1884.—It may be interesting to note the names, rank and land grants of the distinguished French *emigrés* in the township of Markam and in other localities round Toronto. These French loyalists, several titled men among them, after escaping the guillotine in France, had applied to the British government for land in Canada. Their names appear in the military correspondence as follows:

Count de Puisaye obtains	850 acres.
" de Chalus, maréchal de camp, colonel	550 "
M. d'Allégre, major-general of the district de Vannes, colonel	450 "
M. de Marseuil, major-general of division, lieutenant-colonel	300 "
Viscount de Chalus, adjutant-general, colonel	350 "
M. Quetton de St. George, major of division, lieutenant-colonel	400 "
M. de Tracy, aide-de-camp, capitaine	350 "
M. Renault, capitaine, without commission	150 "
M. Séjéant, lieutenant	150 "
Fouchard, Furose, Langevin, Bugle, Marchand, non-commissioned officers and soldiers	500 "

M. Renault was besides recommended for a grant of 1,200 acres and M. Séjéant for a grant of 500 acres.

So far as can be ascertained one family only, that of M. Quetton de St. George, is now represented in western Canada.

The report for this year mentions among the acquisitions to the archives, the volumes presented by the right honourable, the master of the rolls in England, the papers of Dr. John Rolph, bearing on the rebellion in Upper Canada in 1837-8; also the letters of Mr. Robert Baldwin, Sir Francis Hincks, David Gibson, William Lyon Mackenzie, likewise original documents and copies received from Detroit, Cornwall. Windsor, Sandwich, respecting the early occupation of those districts, We are also informed that copies are being made in Rome of documents, till then inaccessible, Archbishop Taschereau having, by the good offices of the historian of Montcalm and Levis, Abbé H. R. Casgrain, undertaken to have them transcribed from the archives of the Gesu and the Propaganda in Rome—a veritable windfall for historical investigators. A curious letter is also given from Charles I. to Sir Isaac Wake, ambassador to France, respecting the rendition of Quebec and Acadia, dated 12th June, 1631.

1885.—Through the researches of Messrs. Brymner and Marmette in London and Paris, important additions were made to our archives this year—documents relating to events preceding or immediately succeeding the establishment of civil government. We note the first murmurs of discontent in the New England colonies; the conduct of the Canadians, both the old and the new subjects, during the war of the revolution; the difficulties which beset Carleton in his government; the bitter hostility of Lord Germaine to the "Saviour of Canada"; the conduct of the war, including Burgoyne's operations; the re-establishment of peace; Colonel Moore's (R.E.) report in 1784; the boundary discussion between Nova Scotia and the easternmost of the United States; Colonel Gother Mann's observations thereon; the notorious career and perfidious machinations of Pierre Antoine Roubaud in Canada and in England; the alleged fabrication by the latter of Montcalm's prophetic letter of 24th August, 1759; Francis Parkman's opinion of this clever rascal; Du Calvet's connection with Roubaud. (p. xiii., 1885.) Another valuable source of information is described in the *Actes de Foye et Hommage*, the fealty rolls, 1667-68-74, setting forth the origin of the old *Seigniories, &c.*

1886.—The report, calendar and appendix of the archivist and his assistant, Mr. Marmette, for 1886, embraces 850 pages. It opens with the proposal of Samuel Waldo for the reduction of Louisbourg in 1758, followed by his plan for settling Nova Scotia.

Mr. Marmette, from Paris, mentions the continuation of his labours, in transcribing documents relating to the history of Canada and Acadia in the "Archives Coloniales," as well as those which the late Mr. George

B. Faribault had not had time to copy when he visited Paris in 1851, some 68 volumes, leaving yet for future examination 400 volumes and *cartons*, exclusive of the "Correspondance Générale." All this goes to prove that the office of our archivist, at home or abroad, was not a sinecure.

The journal of Le Gardeur de St. Pierre, made accessible for the first time to the English reader, sheds light upon the expedition made by him and Marin for the discovery of a western sea.

In 1755, he, with a party of Indians, formed part of Dieskau's expedition to Lake George, where he was killed whilst Dieskau was trying to draw the British forces into an ambuscade.

New details follow on the campaign of 1759-60, in General Haldimand's correspondence and that of his secretaries, 1762-91 : the rivalry between the Hudson Bay Company, chartered in London in 1670, and our Northwest Company, founded in 1783-84, by Montreal merchants, modified in 1798 and partly re-constructed under the name of the X Y Company by partners who had broken from the Northwest Company. The rivalry culminated, in 1816, at Assiniboia by the murder of the governor, Mr. Semple, under the cannons of the fort.

The correspondence of the period shows that in 1797-98, the Northwest Company had built a canal on the Canadian side of Sault Sainte Marie, one of the finest canals constructed on this continent.

The early canals, erroneously described as French works, were opened under English rule, as results from Bougainville's "Mémoires sur l'état de la Nouvelle-France," 1757. No canal then existed at the Cascades. Colonel Gother Mann, R.E., in his report on the state of the canals, dated 24th October, 1800, says they were first built between 1779 and 1783, and recommends their enlargement.

"Much of the interest in the history of these canals lies in the fact that they were the germ of the vast canal system now in existence."

The names of Lord Selkirk, Sir John Johnson, Baby, Franchère, Mabane, Ennys, Frobisher, occur repeatedly in this extensive collection of letters.

1887.—Much needed light has been thrown by the copying of the voluminous correspondence of General Haldimand, a distinguished soldier of Swiss extraction and an able administrator, charged with watching over the destinies of Canada in peculiarly troublous times.

There are few of our governors whose official acts have been more misrepresented and motives unjustly ignored or challenged by our historians.

Haldimand was born at Yverdun in Switzerland. In 1756, he was commandant at Philadelphia, and served with distinction during the seven years' war.

On the capitulation of Montreal in 1760, he was appointed to the

command of the town, which he retained until he was sent to Three Rivers, in June, 1762, where he acted as *locum tenens* for Ralph Burton. The latter had been sent to take part in the reduction of Havana, whilst James Murray was governor of Quebec, Gage of Montreal, Lord Amherst being governor-general.

In 1767, we find Haldimand in charge of east and west Florida. In 1773, he was in military command of east and west Florida. In 1773, he was military commander at New York. Stationed in Boston in 1775, he leaves that year for London, from whence he is sent as inspector-general of the forces in the West Indies. On the 30th June, 1778, he landed at Quebec, succeeding Guy Carleton as governor-general of Canada, where both had served in 1759. His administration lasted until 1784, marked all through by firmness, administrative ability, during a most trying period.

On his return to England in 1784, he was assailed by Pierre Du Calvet, a Huguenot and a trader of Montreal, and sued for false imprisonment, though the British government stepped in and held him harmless against the machinations of his merciless persecutor.

Du Calvet was nothing but a traitor in disguise, of whose guilt, Haldimand, when governor at Quebec, had ample proof. He had escaped with a few years of imprisonment in the Récollet convent at Quebec and on board of the war vessel "Canceaux." Some think his proper place ought to have been on a gibbet, as a warning to disloyalty.

1888.—The correspondence and papers acquired by our archives office this year were of no ordinary importance; in fact, indispensable to whoever wishes to write or study the history of the dependency. The last volumes of the Haldimand collection, consisting of 233 volumes, with Col. Bouquet's collection of thirty volumes, were deposited in Ottawa; both cover interesting periods of Canadian history. "There are no other copies of these collections on this continent, adds Dr. Brymner, and their existence here has led to a very considerable amount of correspondence. The correspondence is steadily increasing, and the demand for the annual reports, not only from learned societies, libraries and individuals on this continent, but from various other points of the world, show the interest that is taken in the work in progress. An examination of the list of works presented will show that these come not only from Canada, but from many states in the American union, &c." A glance at the table of contents will suffice to justify the statements of the archivist on this point. I subjoin the leading ones:

The Walker Outrage at Montreal, 1764.

Memorial by the Prisoners, with accompanying documents.

Report of Chief Justice Hay.

List of the Grand Jury.

General Murray's Recall.

Petition of the Quebec Traders.
Petition of the London Merchants.
The *Seigneurs* of Quebec to the King.
The French *Noblesse* in Canada after 1760.
Sir Guy Carleton to Lord Shelburne.
Memorial of the Chevalier de Léry.
A General State of the French *Noblesse*, actually resident in the Province of Quebec or in the French service, and where resident in November, 1767.
Canadian officers in actual service in France, whose parents have remained in Canada.
Pierre Du Calvet. Reply by Father de Berry to the calumnies of Pierre Du Calvet against the *Récollets* of Quebec.
The Northwest Trade.
Report from Charles Grant to General Haldimand on the Fur Trade.
Petition from the Northwest Traders.
Benjamin Frobisher to Dr. Mabane.
Order to Captain Robertson to report on Lake Superior for a Post.
Captain Robertson's Journal.
General Haldimand to Lieutenant-Governor Hay.
The French Royalists in Upper Canada.
Sketch of an establishment to be founded in Canada for the settlement of the French emigrants.
Duke of Portland to President Russell.

List of French Royalists gone from London with Count Joseph de Puisaye for Canada.

Haldimand Collection, covering a vast number of colonial matters; statistics of the trade of Quebec, 1768-83; correspondence with Major Nicholas Cox, lieutenant-governor of Gaspé, 1774-86; letters of Chief Justice Livius, 1777-84.

Papers relating to Pierre Du Calvet, 1776-86.
Papers relating to Pierre Roubaud, 1771-87.
Papers relating to the case of Joseph Despin, 1778.
Papers relating to the cartel sloop "Sally," 1778-81.

The documents deposited in the archives office contain among other damning evidence of the traitorous designs of the disaffected citizens during the invasion of 1775, a list of persons from England, Scotland, Ireland, America, France, acting on behalf of the invaders, and who "fled upon the latter leaving,"—John and Asklan Bondfield, John Welles, Thomas Walker, Edmond Antill, Major Moses Hazen (who had served under Wolfe) Pelissier, John Blake, Price, Heywood and others.

Pierre Du Calvet, the agitator had held a commission as ensign, under Moses Hazen as appears by his receipt for pay, discovered among Lt.-Col. Antill's papers, at Holland House, Quebec. Congress compen-

sated him for his losses in 1786, paying him half of his claim, when he boasted that he was the only creditor Congress had paid. This unconvicted traitor escaped the halter or drumhead court martial.

1889.—The archivist's report for this year sets forth among other documents and memoirs copied or acquired for the Ottawa Public Record Office, various papers on the Northwestern Explorations; the journal of the famous explorer La Verendrye, 1738-39; Capt. Holland's plan to explore from Quebec; religious, educational and other statistics; summary of the Census of Canada, 1784; list of parishes, &c., of the diocese of Quebec; census of clergy; return of Indians; the Vermont negotiations; statement by Mr. Jarvis; Col. Bouquet to General Amherst; General Amherst to Col. Bouquet; Bouquet's proclamation against settling, 1761; Bouquet's proclamation with regard to Indian lands; letter-book of Col. Bouquet, 1757-58; correspondence with General Amherst, 1759-63; correspondence with General Washington; inventory of the effects of the late Brigadier-General Bouquet, 1765; statement of militia; ecclesiastical state of Canada; Levi Allen to Governor Simcoe; the Bouquet papers; the reservation of Indian lands.

"Col. Bouquet was a native of Switzerland, and served in the Dutch and Sardinian armies. He and Haldimand were in 1754, selected to raise men for the 'Royal Americans,' a corps intended for the British service in America, the officers of which were to be either American or foreign Protestants: this corps was afterwards known as the 60th Rifles. Bouquet was actively employed in America during the last years of the war between France and Britain and held a leading command in the contest with the Indians, including the period of the Pontiac war. He died in Pensacola, western Florida, some time previous to the 4th September, 1765."

Bouquet was a thorough soldier, well trained, possessed of considerable ability.

1890.—A rich mine of information to students of history is revealed by the publication of the archivist's report this year. The position of General James Murray, the first governor of Quebec, appears to be anything but enviable, placed as he is between carrying out the paternal instructions of the king towards his new subjects the French Canadians, and the hostile feeling existing towards them, by the rude and ignorant class of settlers he describes, calling themselves the king's old subjects. The administration of justice; the constitutional act of 1791; Northwest explorations; relations with the United States after the peace of 1783: such are the leading subjects in this report.

The claim set up by Lord Amherst to the Jesuits estates is discussed, as well as Col. Morse's report of 1783, who expressed the opinion that by the union of the maritime provinces with Canada, "a great country might be raised up, with a general government, having its seat in the island of

Cape Breton." The reasons for disfavour urged by the neighbouring colonies against the Quebec act of 1774, sound strange in the present day. New England was in arms against old England for legislation recognizing the Roman Catholic religion, "a religion, they said, which had flooded with blood and had spread hypocrisy, persecution, murder and revolt into all parts of the world."

The American Philosophical Society of Philadelphia styled it "a bill for establishing popery and arbitrary power in Quebec."

Such declarations the colonies found it difficult to explain, when in 1775, they tried to secure the French Canadians as their allies against Great Britain.

The correspondence between Lt.-Col. By, R.E., General Gother Mann, R.E., and Sir Carmichael Smith, throws a flood of light on the works undertaken on the Rideau canal.

1891.—The calendar and appendix of the archivist this year disclose a voluminous correspondence and stringent regulations of Governor Prescott and Governor Simcoe concerning the grants of waste lands of the Crown.

Among applicants for large tracts in Upper Canada, appears the name of the double-traitor Benedict Arnold; he urges great personal losses incurred and services rendered to the British cause.

He first modestly claims 20,000 acres in Upper Canada, upwards of thirty-one square miles, and in July, 1797, he applies to the king, by petition, for 50,000 for himself, his wife and seven children.

On the 17th May, 1794, the Council records a grant of 14,000 acres to Wm. Berzey, of York, Upper Canada, to settle there 2,000 settlers brought in by him.

The marriage laws of Upper Canada seem to have been in an unsettled state. Richard Cartwright, junior, reports on them.

We are next treated to a curious correspondence referring to the French Republican designs on Canada. War existed between England and France, in 1793; later on French armies were striking terror and reaping bloody laurels all over continental Europe.

French emissaries, it seems, were sent to the United States, to enter into correspondence with the French element in Lower Canada. The evidence produced at the trial of Alexander McLean, supposed to be in league with this movement is given, and allusions made to his tragic end, on the gallows, at Quebec in 1797.

1892.—Hon. Mr. Angers, Minister of Agriculture, submits this year the archivist's report to the legislature, "to wit, transcripts of the state papers for Lower Canada to 1825, a continuation of the administration of General Brock, and in addition those of Sir Peregrine Maitland as acting governors, Lord Dalhousie as governor-in-chief, Burton as president of the council and the resumption of office by Lord Dalhousie in September, 1825."

The papers during that period deal with matters of great interest; the proposed union in 1822 of the two provinces, with the arguments for and against the proposal, which, it is well known did not take effect till twenty years later; the report on grievances, the questions between Upper and Lower Canada respecting the re-union, and other subjects held at the time to be of vital importance.

"For Upper Canada transcripts have been received to 1829, covering the period of Sir Peregrine Maitland's administration and the beginning of Sir John Colborne's.

"To judge by the current histories of Upper Canada, the knowledge of the domestic politics of that province at the beginning of this century appears to be very limited, only a few vague generalities being given.

"It has, therefore, been thought desirable to publish at some length the correspondence during the administration of President Grant, and part of that of Lieutenant-Governor Gore. The leader of the opposition to the government, appears to have been Mr. Justice Thorpe, who is referred to in no laudatory terms in the histories of the province."

The sentiments expressed by this "hot, political partisan," his fiery attack on General Hunter and the comments of Chief Justice Allcock on his fiery colleague, afford quite a study in the present day.

In Lower Canada, Sir Robert Shore Milnes seems anxious to increase the crown revenues, from properties belonging to it, and advocates the extinction of the feudal tenure of lands.

There appears to have been a considerable amount of friction between Chief Justice Osgoode and the Lieutenant-Governor, the latter being supported by all the executive councillors.

A conversation between Monsgr. Plessis and Attorney-General Sewell, in which Queen Mary gets some hard hits, is published in this report.

1893.—The report for 1893, opens with a letter, dated 16th November, 1807, on Indian affairs, received by Sir John Johnson, from Herman Witrius Ryland, civil secretary to Sir James Henry Craig.

As this clever functionary's correspondence occupies considerable space in our colonial archives, a short sketch of his career may not be out of place.

Herman Witrius Ryland had landed in Quebec in 1795, as secretary to Lord Dorchester. His scholarly training, brilliant parts, general information and attachment to British institutions, as well as his social position, gave him the ear of every governor, (except Sir George Prevost) for close on twenty years.

It was during the stormy period of the war between England and the United States that the Hon. Mr. Ryland, with the advice of the able Chief Justice Sewell, was in reality entrusted with the helm of state.

As the historian Robert Christie observes, Ryland was considered

the "Fountain Head of Power." Probably never was he more powerful than under the administration of Sir James H. Craig. His Excellency despatched him to England, charged with a public mission three fold in its scope, the ostensible object of which was, 1st, To get the Imperial Government to amend or suspend the constitution. 2nd, To render the government independent of the people by appropriating towards it the revenues accruing from the estates of the Sulpicians of Montreal, and of the order of the Jesuits. 3rd, To seize the patronage exercised by the Roman Catholic bishop of Quebec, the *curés* or church livings in his diocese, contending that no Roman Catholic bishop really existed in Canada, (but merely a superintendent of *curés*) none having been recognized by the Crown.

It has been stated that he had a fair chance of succeeding on two points, had not the great Chancellor Lord Eldon intervened to thwart the scheme.

The correspondence exchanged between Mr. Ryland and his Excellency Sir James H. Craig, to be found in the sixth volume of Christie's "Parliamentary History of Canada," exhibits Mr. Ryland at his best Withdrawn from public life, he expired at his country seat at Beauport, near Quebec, on the 29th July, 1838.

Sir James H. Craig, though he had served with credit in Canada during the invasion of 1775, was scarcely the administrator to be entrusted with the rule of the colony in such troublous times. His idea of governing seems to have savoured more of the military discipline of the camp; he failed to win the support of the discontented majority, making himself disliked by parliament, though seemingly inspired by the best intentions.

Among other matters referred to in his voluminous correspondence with the home government one subject was constantly uppermost in his mind, as early as 1807—a rupture close at hand between the United States and England, though it only actually occurred five years later, in 1812, after his departure for England. The obnoxious right of search at sea was the ostensible pretext, possibly not the real cause of the outbreak

A split had taken place in the American congress; two hostile parties had sprung up, the federalists representing the New England states. They were opposed to war and agitated for neutrality in the event of hostilities, with the secret intention of seeking the protection of England. The other party, the democrats, apparently spoiling for a fight, thought the time propitious, when England. battling against coalesced Europe, led by the greatest captain of modern times, had her hands full at home.

The secret correspondence on this matter will repay perusal. One John Henry, of Montreal, seems to have made himself very officious, visiting Boston and the state of Vermont, collecting and conveying to Sir James H. Craig secret information about popular feeling in these centres

during the period of disquietude and alarm in Canada consequent on the extraordinary triumphs of French arms in Europe.

One incident alluded to in his correspondence increased very much the dislike the French Canadians felt for the governor—the seizure, on his orders, by a military force, in 1808, of the printing press of *Le Canadien* newspaper and its forced sale at auction (Sir James became himself the highest bidder), the arrest and incarceration of three distinguished members of parliament, Messrs. Taschereau, Bédard and Blanchet, one M. Borgia, an advocate, and Mr. Planté, all connected with *Le Canadien* as owners, printers or contributors.

But there were other topics less exciting than rumours of an impending war to engage the attention of Sir James.

Government had determined, among other projects, to encourage the growth of flax and hemp by subsidies. In connection with this industry, Louis Foy, storekeeper-general for the Quebec district, Mr. Green, for Montreal, and Mr. Campbell, for Three Rivers, had been appointed to control it. The experiment, however, met with indifferent success.

Amongst the documents collected occur several letters as to the best means to secure the good-will of the Indians near Detroit, Caughnawaga, the Two Mountains, etc., in the event of war; despatches concerning remittances to the Nova Scotia treasury and to Quebec touching fortifications in the latter place; increased barrack accommodation for soldiers, land grants to court favourites; pensions to the widows of distinguished colonists; the appointment of Chief Justice Sewell as successor of Chief Justice Allcock, deceased; the raising of the Glengarry fencibles and other provincial corps; the selection of new members for the legislative council; preparations for naval operations on the western lakes; the help that might be expected from the militia in case of war; the necessity for new regulations for this arm of the service; demands for ordnance stores, land grants to U. E. loyalists.

The Lower Canada documents occasionally exhibit a mass of subjects submitted for adjudication to the highest officers of the crown in England, now dealt with by parish councils, such as roads, bridges, markets, police, apprentices, constables, etc.

Lieutenant-Governor Gore's correspondence, 1807-10, with Lord Castlereagh discloses many minor incidents hitherto unknown anent the early times in Upper Canada—land grants, Indian stores, public appointments.

One lights again on "Observations on the Culture of Hemp and Propagation of the Warren Rabbit, etc., by a member of the Upper Canada Agricultural and Commercial Society;" a request for a pension by the widow of Capt. Joseph Brant, principal chief of the Mohawks, who died 27th November, 1807; the deserter Underhill shot, inquiry into the circumstances of the case; Col. Claus, an Upper Canada worthy.

On the 8th October, 1811, that great and good soldier General Isaac Brock, after serving six years in Quebec with his regiment, the 49th, appears on the scene in Upper Canada as acting governor. Boulton's release from a French prison ; £5,000 appropriated to maintain the militia in readiness for the impending struggle with the United States. "Perfect reliance," says Brock, "can be placed on the loyalty of the original inhabitants and their descendants." And was he not right ?

General Brock also proposes "that at the present juncture (1812) "the prince regent should be moved to give permission to place the family of every soldier, regular or militia, also every mariner on the lakes, who may be killed in the coming contest with the United States, upon the U. E. list, and to extend this advantage to every mariner and militiaman who may be maimed or disabled upon actual service."

We next are made acquainted with the proclamation of General Brock in answer to that of General Hull. Hostilities follow, and history completes the glorious record of victories won on Canadian soil, ending in the retreat of the invading foe.

But I must not trespass on your forbearance any longer, and shall bring my remarks to a close ; and if, laying aside the detached survey we have been making of the manuscript sources of our history, we should like to crowd in one canvas the brilliant outlines embracing the fruitful era of discovery, adventures, warfare, religious enthusiasm, which one of our most gifted viceroys, the late Earl of Elgin, styled "the heroic age of Canada," what would you find ? A succession of martial feats ; examples of individual bravery ; instances of extraordinary physical endurance at the call of duty ; deadly ambuscades surrounding the pioneers of a Canadian wilderness ; savage encounters by sea and by land of a most startling nature, when measured by the standards of to-day.

At one time, 'tis the intrepid, conscious sacrifice of zealous preachers of the gospel—in order to lift upwards into a higher life and cleanse debased humanity—men of prayer and pure mind, looking on death as the only earthly crown worthy of living for.

At another time, 'tis delicate, self-sacrificing maidens, some, of courtly nurture, bidding an everlasting adieu to the charmed circle of Parisian gaities, braving the tempests and perils of the deep, to cast their lot amidst the rude aborigines hutted round their new forest homes on the shores of our great lakes and rivers.

To-day, Indian savagery in its most hideous form is triumphant amid the corn and wheat fields of Lachine : the great massacre in August, 1689.

To-morrow, lion-hearted old Governor Frontenac, with fire and sword, will bring the barbarians to sue for peace on their knees, or warn with his big guns, from the gates of Quebec, the New England marauders.

Pierre Le Moyne d'Iberville, the Cid of New France, will bear the triumphant flag of his country to the icy shores of Hudson's Bay.

La Verendrye, de Sales and Marquette will explore the Rocky Mountains and Mississipi, the father of the waters.

Dollard des Ormeaux, the Canadian Leonidas, will, after deep aforethought, by solemn covenant, pledge his life and the life of his sixteen brave followers, to thrust back the wave of Indian ferocity surging round Montreal.

No poet to sing, no annalist to chronicle the manly deed; all the actors, save a Huron brave, perished—he it was who revealed the fact.

Is not our history also lighted up with the sweet, thoughtful faces of heroic women—noble examplars to their sex—beacons from on high, illumining the rugged paths of struggling humanity: Madame de Champlain, the Lady Latour, Madeleine de Verchères, Laura Secord; nor is the race extinct.

I have striven to reveal to you Canadian history in its rude beginnings. You have also had occasion to note its austere and patriotic teachings.

Has your heart not also thrilled at its wild, seductive graces, when touched by the wand of that enchanter, Francis Parkman, our late lamented colleague?

With the wealth of material already garnered in our archives and daily added to, may we not count on it, at no distant future, as a stately fabric? Shall we compare it to an antique Grecian temple, with graceful portico and many ornate columns, on which posterity will inscribe among other respected names, those of Baron Masères, Wm. Smith, Robert Christie, Bibaud, Garneau, Ferland, Faillon, Turcotte, Sulte, Casgrain, Bourinot, Withrow, Hannay, Miles, Murdock, Watson, Dent, Brymner, Kingsford, Begg, Scadding, Ganong?

SESSION IV. (May 16th.)

The reading of reports of delegates of societies was resumed:

XXIII.—From *The Canadian Institute*, Toronto, through Mr. O. A. Howland, M.L.A.

On behalf of the Canadian Institute, I have the honour to communicate the following report of its proceedings during the past year:

The forty-sixth annual report of the council was read by the secretary, Mr. Alan Macdougal, C. E. The council expressed their regret in announcing the death of a past president, Mr. Charles Carpmael, M.A., F.R.A.S., who died last fall in England. He had been a member for sixteen years, many of which were spent as a member of council, and during four years he occupied the president's chair. There were 24 meetings of the institute, at which 24 papers were read. The attendance was well kept up, and was in advance of last session. The biological

section held ten meetings, at which seven papers were read. At the historical section two papers were read. The geological and mining section held five meetings, at which five papers were read. An address by Prof. Garner on his experience in Africa and observations as to the language of monkeys attracted a large audience. Proceedings in regard to the promotion of a national museum were adverted to. The much-needed extra accommodation to the library has been secured through the special grant given to the institute last year; ample pigeon-hole space is now secured for the current exchanges; a stock-room with shelving has been formed, and is full of books. A pleasing event of the session was the presentation of a portrait of the secretary in oil, by Mr. W. A. Sherwood, A.R.C.A. The painting does honour to the artist, and as a work of art is a fitting companion to the other portraits now on the walls. Measures have been taken, and steps are still being taken, in regard to the proposed unification of the civil, astronomical, and nautical day, the adjudication of premiums for the essays on electoral representation and the rectification of parliament, and the invitation to the British Association for the Advancement of Science.

Financial Statement.

The total amount received from all sources was $2,104.64, of which was expended $2,054.64, leaving a balance in the hands of the treasurer of $50.20. A proximate estimate of the assets and liabilities of the institute showed a balance of $27,000 in favour of the institute. The details of the archæological, binding, and building accounts were then given, which showed a balance in bank to the credit of the archæological fund of $549.32, of the binding fund of $632.73, and of the building fund of $102. In every department the strictest economy has been observed, and it is doubtful whether there is another institution in the city in which as much useful work has been done at so small an expense. The various accounts were examined and certified correct by the auditors, Mr. W. A. Douglass and Mr. Levi J. Clark.

Books and Periodicals.

The librarian's report showed a large amount of work done. The number of books and periodicals received during the year ending last March was as follows: By purchase, 733; by donation, 206; by exchange for the institute's transactions, 2,611; being a total from all sources of 3,550. The exchanges were received from about 540 societies, scattered through the following countries: Canada, which supplied 169 numbers of periodicals; the United States, 572; Mexico, 18; South America, 59; West Indies, 2; Great Britain and Ireland, 434; Austria and Hungary, 155; Belgium, 23; Denmark, 8; France, 394; Germany, 238; Italy, 171; Netherlands, 48; Norway, 33; Portugal, 8; Russia, 77;

Roumania, 2; Spain, 25; Sweden, 26; Switzerland, 16; British India, 48; Java, 19; Japan, 23; Australia, 24; China, 2; Africa, 17. It is very doubtful whether such a large amount of periodical literature, containing the latest intelligence from all parts of the civilized world, and including every department of science and literature, can be found in any institution north of the Smithsonian Institute at Washington. It is a great pity that it is not more used and valued.

Work Accomplished.

Papers read during the session of 1894-95:

1894.

Nov. 3—Opening Address by the President: "Work of the Institute Reviewed; Provincial Museum Advocated," Prof. R. Ramsay Wright, M.A., D.Sc.

Nov. 10—"The Spirit of National Art" (2nd paper), W. A. Sherwood, A. R. C. A.

Nov. 17—"Corals," Rev. J. J. Hare, Ph.D.

Nov. 24—"A Notice of Samuel Holland, first Surveyor-General of British North America, based on a hitherto unpublished autograph letter addressed to him by Governor Simcoe in 1792," Rev. Dr. Scadding; read by Dr. Kennedy.

Dec. 1—"A Plea for a Geodetic Survey of Canada," by P. K. Hyndman, P.L.S.; read by the secretary.

Dec. 15—"Co-operation in England," S. D. Mills.

Dec. 15—"Aboriginal American Inscriptions in Phonetic Characters," Rev. Prof. Campbell, Montreal; read by Dr. Kennedy.

1895.

Jan. 5—"A Recent Contribution to the Ossianic Controversy," by Rev. Neil MacNish, LL.D.; read by Dr. Kennedy.

Jan. 12—"Art in Its Relation to Religion," T. Mower Martin, R.C.A.

Jan. 19—"The Aurora Borealis: Its Connection with Magnetic Earth Currents," G. G. Pursey.

Jan. 26—"Aerolites," Arthur Harvey.

Feb. 2—"The Æsthetic Unity of the Fine Arts," Hamilton McCarthy, R. C. A.

Feb. 9—"Raids and Legal Actions in Canada Arising from Slavery and the Late Civil War," J. C. Hamilton, M.A., LL.D.

Feb. 16—"Life in the African Jungle," Dr. R. D. Garner.

Feb. 23—"The Fur Trade from 1784 to 1812," Capt. Ernest Cruikshank; read by Dr. Kennedy.

March 2—"The Eye-Spotted Bud Moth (*Trutocera ocellana*)," D. W. Beadle, M.A., LL.B.

March 9—"Some Principles in Grammar," Geo. A. Chase, B.A.

March 16—"Toxins and Antitoxins," J. J. Mackenzie, B.A.

March 23—"Tea, Coffee, and Cocoa" (illustrated by the lantern), Prof. W. H. Ellis.

March 30—"Bi-metallism," Prof. Mavor.

April 6—"The Religonæ Celticæ," Rev. Neil MacNish, LL.D.; read by Dr. Kennedy.

April 13—"The University Biological Museum," Prof. R. Ramsay Wright.

April 13—"A Comparative Study of the Gastric Mucous Membrane," Dr. R. R. Bensley; read in title by Prof. R. Ramsay Wright.

April 20—"The Hinterland of Ontario," Thomas W. Gibson.

Total number of papers read during the sessions of 1894-95, twenty-four, which may be classed as follows:

Archæology	1
Biography	1
Biology	3
Fine Arts	3
Geodesy	1
Geography	2
Grammar	1
History	2
Literature	2
Meteorology	2
Museums	1
Natural History	3
Political Economy	2
Total	24
Read at the meetings of the Biological section	7
" " " Historical "	2
" " " Geological "	5
Total	38

The reports of the natural history, the historical and the geological and mining sections showed, as usual, a large amount of valuable work accomplished.

Election of Officers.

After the various reports were received and adopted, the offices left vacant at last meeting were filled, so that the complete list is as follows:

President—Prof. A. B. Macallum, Ph.D.

First Vice-President—Mr. J. C. Hamilton, M.A., LL.B.

Second Vice-President—Mr. B. E. Walker.

Secretary—Mr. Alan Macdougal, C.E.

Treasurer—Mr. James Bain, jr.

Librarian—Mr. D. R. Keys, M.A.

Curator—Mr. J. H. Fleming.

Editor—Dr. Kennedy, LL.D.

Chairman of the Natural History Section—Mr. John Maughan.

Chairman of the Historical Section—Mr. O. A. Howland, M.P.P.

Chairman of the Geological and Mining Section—Professor A. P. Coleman, Ph.D.

Members of Council—Mr. Arthur Harvey, F.R.S.C., Mr. G. G. Pursey, and Daniel Clark, M.D.

Honorary Membership.

A graceful and well-deserved tribute of respect and esteem was tendered to Geo. Kennedy, M.A., LL.D., by electing him an honorary member, for his long and valuable services as editor of the proceedings and transactions of the institute, and his well-known abilities and attainments.

Finally, I have the honour to report the matter which has been specially reported to this society in a paper read before the Literary Section, showing that under the auspices of the Canadian Institute, and with the assistance of the government and universities of the province of Ontario, a measure is being initiated for holding at Toronto an international historical exhibition in the summer and autumn of the year 1897, the 400th anniversary of the discovery of Canada and the American continent by John Cabot.

XXIV.—From *The Botanical Club of Canada.*

From the appended list of addresses of members reporting within the year, it will be seen that the membership is increasing and becoming more representative of every portion of the Dominion. The following distribution is shown :

Newfoundland	5	Assiniboia	2
Prince Edward Island	3	Saskatchewan	6
Nova Scotia	60	Alberta	5
New Brunswick	13	British Columbia	60
Quebec	5		
Ontario	13	Total	201
Manitoba	29		

The financial statement appended shows that although the expenditure has been very much greater than during any previous year, yet the balance falls on the right side of the account.

The club lost by death, on the 20th of November, 1894, Mr. Francis Bain, secretary for the province of Prince Edward Island. He was the leading scientific authority in the province during the latter years of his life, as the published records of his work indicate. He has been succeeded in the secretaryship by his colleague, Principal John MacSwain, of Charlottetown.

In the provinces of Quebec and Ontario botanical work is progressing as usual, although much has not been reported from members of the club.

In Newfoundland, Rev. A. C. Waghorne has been indefatigable in

his exploration of the island, and has added many species to its flora and a few new to science. He is continuing the publication of the flora of the island in the Transactions of the Nova Scotian Institute of Science.

In the Atlantic provinces generally there is a very considerable improvement in the character of the work being done. The formation of local herbaria has already commenced at several points.

In central Canada the extension of our work has been specially active. In Winnipeg and at several other points in Manitoba local organizations have been formed. The study of the leading botanical species of interest in agriculture is required in the public schools throughout the province.

In Alberta the exertions of our new secretary have resulted in the formation of local natural history organizations at Calgary, at Olds, and probably at Red Deer.

Our secretary for British Celumbia has aroused very considerable interest in the work of the club in the city of Victoria and other centres of population in that province. To aid beginners he published a small handbook of instructions for the collection and preservation of wild flowers, ferns and seaweeds, a work which makes a very natural introduction to the "Botanical Collector's Guide," by Prof. Penhallow, secretary for the province of Quebec.

Blanks for phenological observations were issued to all members in January, so that by another year the range of the observations may justly be expected to widen. Without this blank, circular no. 6, the following have sent in a schedule of observations for the year 1894, some of the observations being very creditable, a great improvement on any former ones in the aggregate. The observers and their stations are as follows: (1) Antoinette Forbes, B.A., Yarmouth, N.S.; (2) C. Stanley Bruce, Shelburne, N.S.; (3) Harry Piers, Halifax, N.S.; (4) Rev. James Rosborough, Musquodoboit Harbour, Halifax, N.S.; (5) Ida Parker, Berwick, N.S.; (6) Prof. A. E. Coldwell, M.A., Wolfville, N.S.; (7) Louise M. Paint, Port Hawkesbury, N.S.; (8) Prof. MacAdam, Antigonish, N.S.; (9) C. B. Robinson, B.A., and W. A. Hickman, Pictou, N.S.; (10) Mary E. Charman, Wallace, N.S.; (11) John MacSwain, Charlottetown, P.E.I.; (12) Henry F. Perkins, Grand Manan, N.B.; (13) Isabella J. Caie, Richibucto, N.B.; (14) Alex. Ross, B.A., Dalhousie, N.B.; (15) Rev. W. A. Burman, B.D., Winnipeg, Manitoba.

A tabulation of the observations on a few of the plants and birds in the schedule referred to is given as an illustration of what has been done. The more complete observations will probably be published in the Transactions of the Nova Scotian Institute of Science, copies of which papers have in the past been sent to all observers. For brevity, the number of the day in the year (1894) is given. These dates can be readily converted into the ordinary form by remembering that the last days of the several months correspond to the days of the year as follows, namely: Janu-

ary, 31; February, 59; March, 90; April, 120; May, 151; June, 181; July, 212, etc.

PHENOLOGICAL OBSERVATIONS, CANADA,

YEAR 1894.

Last day of January, 31 of the year.
" " " February, 59 " " "
" " " March, 90 " " "
" " " April, 120 " " "
" " " May, 151 " " "
" " " June, 181 " " "
" " " July, 212 " " "

	Yarmouth, N.S.	Shelburne, N.S.	Halifax, N.S.	Musq. Harbour, N.S.	Berwick, N.S.	Wolfville, N.S.	Average for Southern Nova Scotia.	Port Hawkesbury, N.S.	Antigonish, N.S.	Pictou, N.S.	Wallace, N.S.	Average for Northern Nova Scotia.	Charlottetown, P.E.I.	Grand Harbour, N.B.	Richibucto, N.B.	Dalhousie, N.B.	Average for New Brunswick Stations.	Average for Atlantic Provinces.	Winnipeg, Manitoba.
Botanical.																			
1. Alder (*Alnus incana*). Catkins shedding pollen	113	107	108	119	119	?	114	135	....	112	109	119	....	108	....	119	113	115	....
2. Aspen (*Populus tremuloides*). Catkins shedding pollen	....	120	....	....	123	....	121	130	....	116	....	123	....	118	....	122	120	122	121
3. Aspen (*Populus tremuloides*). Leafing out	....	140	....	....	147	....	143	155	....	150	....	152	....	144	....	....	144	147	134
5. Red Maple (*Acer rubrum*). Flowering (E)	120	118	137	134	115	120	124	....	132	123	120	125	....	126	136	134	132	126	116
8. Mayflower (*Epigaea repens*). Flowering (E)	69	104	74	110	101	112	95	121	117	110	115	116	124	115	117	....	116	107	....
9. Dandelion (*Taraxacum officinale*). Flowering	112	124	....	137	132	130	127	138	127	131	137	133	....	....	....	133	133	130	140
13. Strawberry (wild) (*Fragaria Virginica*). Flow'g.	114	124	133	138	126	133	128	140	136	128	137	137	144	131	135	132	133	132	144
14. Strawberry (wild) (*Fragaria Virginica*). Ripe fruit	156	....	167	....	162	....	162	186	....	....	171	178	....	167	173	....	170	169	163
18. Wild Red Cherry (*Prunus Pennsylvanica*). Flowering	142	121	155	155	132	145	142	....	154	....	151	152	....	157	....	156	156	147	140
19. Indian Pear, June-Berry (*Amelanchier Canadensis*). Flowering	138	131	142	149	....	139	140	153	152	151	....	152	....	138	....	150	145	144	140
22. Apple (cultivated). Flowering	144	....	....	162	143	149	149	165	152	152	150	155	....	161	155	....	158	154	....
25. Hawthorn (*Crataegus*). Flowering	168	156	170	170	159	159	164	....	....	....	157	157	....	....	169	....	169	164	141
26. Lilac (cultivated) (*Syringa vulgaris*). Flowering	163	....	....	170	153	157	161	167	161	....	159	159	....	168	161	....	164	162	....
Zoological.																			
44. Robin (*Merula migratorius*). (E & C)	60	79	74	...	61	77	70	87	....	82	60	76	....	....	....	100	100	76	105
52. Swallow (*Tachycineta bicolor*)	109	109	116	....	110	126	114	130	....	118	....	124	....	107	....	149	128	119	147
55. Hummingbird (*Trochilus colubris*). (E & C)	137	....	....	....	136	137	137	150	..	....	149	149	....	....	....	157	157	144	....
57. Nighthawk (*Chordeiles Virginianus*). (E & C)	....	....	149	....	140	....	142	188	....	163	....	175	....	152	....	....	152	158	145
67. First date at which "Frogs" are heard whistling	96	106	112	....	108	111	107	125	....	....	113	119	....	....	....	116	116	111	113

Three important recommendations to working members of the club:

1. *Phenology.*

In all good common schools, and especially in every high and county academy, there could be compiled from year to year and carefully preserved for comparison, with very great advantage to the stimulation of the observing instinct of pupils and even of more mature students, and to the general development of the scientific habit and culture in the community, local lists of the times of flowering, etc., of plants, to be permanently kept in the archives of the school. From year to year these might also be reported to county or provincial centres, with much addition of interest to the local work. Summaries of these local observations might be published annually in the transactions of local societies or in the local newspapers. Provincial summaries might in like manner be published in the transactions of provincial societies or in the provincial newspapers. Local and provincial statistics could then at any time be collated and compiled for dominion or continental range.

All schools making observations should most punctiliously receive credit for their contribution to the provincial summaries based on them, when these summaries or generalizations are published. In this way a great deal of valuable information could be gathered, practically without cost, and positively to the advantage of scientific training in the schools of the whole of Canada.

There is often a very great difference in the times of flowering of plants even in the same small circumscribed locality, according as the place is a specially sheltered one or otherwise. In a spot abnormally situated with respect to the heating of the sun's rays and to protection from cold winds or even cold air in some cases, a solitary plant may bloom in January, and a butterfly burst from its chrysalis in February. To count such sports as indicating the date of the first normal appearance of flowers, etc., for a given locality, would be very misleading. The uniform adhesion to the practice of recording two dates when necessary is recommended. *First*, the date of the sport, if one should be observed, inclosing it within brackets; *second*, the date of the first flowering which is immediately followed by the rest of the same species in the particular locality. The latter date is the one which is of the greater importance, perhaps the only one of very much importance from a general point of view. The first or abnormal appearance is often, however, of great local interest, and by inclosing it within brackets, the two dates may be recorded on the same line; but, for section, district, or province averages (botanical sections, districts and provinces), the normal first appearance would alone be utilized.

The recording and publishing of phenological observations in as many localities as possible in the manner suggested above is one of the objects of

the club. And, while all the local floras should receive attention for local purposes, a special effort should be made to secure accurate dates for all the plants, etc. (so far as they may be found in the locality) which are contained in the list compiled by the committee of the Royal Society for standards of comparison throughout the whole range of the Dominion.

2. *Local Floras.*

The formation of a standard list of the flora of each locality, so that a report of the number of species known to be contained in it may be given each year, briefly under, say, the following provisional heads; Dicotyledons....., Monocotyledons (non-glumaceous)....., Glumales (grasses and sedges)....., Pteridophyta (ferns, horsetails and club-mosses)....., Bryophyta (mosses and liverworts)....., Other Cryptogams..... ; Total Species..... ... The additions to the flora of any locality during the year may then be briefly reported thus: D....., M... ....., G....., P....., B..... O. C..... ; T. Sp.....

3. *Aid in Determining Plants.*

The herbarium in the museum of the geological department at Ottawa—the nucleus of which is the private collection of Professor John Macoun—has been increased to many times its original size during the past ten years. Professor Macoun or his assistants have collected in all the provinces, and many additions have been received from botanists working in various parts of the Dominion, so that the herbarium now contains, with few exceptions, specimens of all plants known to occur in Canada. The aim has been to procure for every species at least one sheet of specimens from each province in which it is found. In addition to this, all forms that differ in the slightest from the type have been preserved, so that, of species of wide distribution, there are in some cases as many as 25 or 30 sheets of specimens. The value of this is shown when the extreme eastern and western forms of common species are compared. Those of the east often appear to present good varietal differences from those of the west; but when the specimens from various other parts of the Dominion are compared with them it is frequently found that they represent intermediate forms running into one another, —that though the extreme forms when considered alone might be taken to be separate varieties, the intermediate forms show that this is not the case. The greatest value of such an herbarium lies in its offering a ready means for the determination of doubtful species collected by local botanists. What may appear to them a new variety of a plant with which they are familiar, may prove to be only a form that is common elsewhere. It is important therefore that, when possible, specimens of all divergent forms should be sent to the "national" herbarium.

In order to encourage the formation of private and other herbaria,

Professor Macoun has offered to receive specimens from any locality and to give in exchange for them an equal number of the *desiderata* of the person or society sending them, the only proviso being: that the specimens be from the vicinity in which the collector resides, and not from several parts of a province. To facilitate such exchange, check-lists will be sent to all who may apply for them. All communications connected with such exchange should be addressed to the "Curator of the Herbarium, Geological Survey Department, Ottawa." Letters and parcels of specimens are transmitted to this address without postage, according to law.

The place and date of collection of every specimen, with the name of the collector, should always accompany it. If this label be lost the specimen may be valueless. If the label should happen to go with the wrong specimen it is worse than valueless.

The most convenient manner of obtaining the determination of plants from the curator of the Canadian herbarium or any other botanist, is to make an exact duplicate of the set, the duplicates being similarly numbered. Where but one specimen has been obtained, it can, of course, be returned to the collector. The botanist determining the plants keeps the set sent him, and returns simply a list of the names corresponding to each number. Great care must be taken, especially in the case of the smaller cryptogams, that one and the same species are in the duplicates. Mistakes often occur from the indiscriminate division of a tuft of moss or lichen supposed to contain only one species, while it may contain two or more, and even these in different proportions, in the supposed duplicate.

General Officers Elected, May, 1895.

President[1]—Prof. George Lawson, Ph.D., LL.D., Halifax, N.S.

General Secretary-Treasurer—A. H. Mackay, B.A., B.Sc., LL.D., Halifax.

Secretaries for the Provinces.

Newfoundland—Rev. A. C. Waghorne, St. Johns.
Prince Edward Island—John MacSwain, Charlottetown.
Nova Scotia—A. H. Mackay (Gen. Sec.-Treas.), Halifax.
New Brunswick—G. U. Hay, M.A., Ph.B., St. John.
Quebec—Prof. D. P. Penhallow, B.Sc., McGill University, Montreal.
Ontario—J. A. Morton, Esq., Wingham.
Manitoba—Rev. W. A. Burman, B.D., Winnipeg.
Assiniboia—Rev. George Arthur, B.Sc., Lake's End.
Alberta—T. N. Willing, Esq., Olds.
Saskatchewan—Rev. C. W. Bryden, Battleford.
British Columbia—A. J. Pineo, B.A., High School, Victoria.

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[1] The president, Professor Lawson, died on the 10th November, 1895, after a brief illness following a stroke of paralysis. Ed.

Constitution, &c., of the Club.

The Botanical Club of Canada was organized by a committee of section four of the Royal Society of Canada at its meeting in Montreal, May 29th, 1891.

The object is to adopt means, by concerted local efforts and otherwise, to promote the exploration of the flora of every portion of British America, to publish complete lists of the same in local papers as the work goes on, and to have these lists collected and carefully examined in order to arrive at a correct knowledge of the precise character of our flora and its geographical distribution, and to aid in phenological observations.

The method is to stimulate, with the least possible paraphernalia of constitution or rules, increased activity in our botanists in each locality, to create a corps of collecting botanists wherever there may be few or none at present, to encourage the formation of field clubs, to publish lists of local floras in the local press, etc.; for which purposes the secretaries for the provinces may appoint secretaries for counties or districts, who will be expected, in like manner, to transmit the same impetus to as many as possible within their own sphere of action.

Members and secretaries, while carrying out plans of operation which they may find to be promising of success in their particular districts, will report as frequently as possible to the officer under whom they may be immediately acting.

Before the end of January at the latest, reports of the work done within the various provinces during the year ended December 31st, previous, should be made by the provincial secretaries to the general secretary, from which the annual report to the Royal Society shall be principally compiled. By the 1st of January, therefore, the annual reports of county secretaries and members should be sent in to the provincial secretaries.

The annual report to the Royal Society will contain, in addition to other information, a corrected list of active members and officers.

To cover expenses of official printing and postage, a nominal fee of twenty-five cents per annum is expected for membership (or one dollar for five years in advance, or five dollars for life membership). Provincial secretaries in remitting the amount of fees from members to the general treasurer are authorized to deduct the necessary expenses for provincial office work, transmitting vouchers for the same with the balance.

The local press will no doubt help in this work with pleasure and profit, and its powerful aid should not only be invoked, but also duly appreciated by the botanists. Where there is no botanist to commence work, all that is necessary is to get one or more collectors, whose collections can be determined and named at any time. Such collectors will find their correspondence with the club officers an admirable means of facilitating

their own botanical studies and of speedily transforming them into genuine botanists.

ADDRESSES OF ACTIVE MEMBERS.

Following are the addresses of active members, with acknowledgment of receipts since the report to the Royal Society of date 25th May, 1894, and up to 27th May, 1895. County and local secretaries, as a general rule, stand first after the name of the county or locality :

Newfoundland.

St. John's City : Rev. A. C. Waghorne (life), provincial secretary ; A. T. W. McNeilly, Q.C. (1898) ; Dr. I. S. Tait, M.A. (1896) ; Principal Holloway, Methodist college ; Arthur White (1896), survey office. Five members.

Prince Edward Island.

Queen's County : John MacSwain, principal Queen square school, Charlottetown, acting provincial secretary, 25 cts. ; J. D. Seaman, principal Prince street school, Charlottetown, 25 cts. Prince County : James Landrigan, principal Kensington school. Three members ; 50 cents.

Nova Scotia.

Halifax County : George Lawson (life), president ; A. H. MacKay (life), Dominion secretary-treasurer and provincial secretary ; Dr. A. W. H. Lindsay, Florence A. Peters, County academy (1898) ; Harry Piers, Stanyan, 25 cts ; G. R. Marshall, prin. Richmond school (1896), 50 cts. ; all of Halifax city ; Rev. James Rosborough, Musquodoboit Harbour. Lunenburg County : B. MacKittrick, B.A., principal County academy (1898). Queen's County : Carrie B. Hemeon, Liverpool. Shelburne County : C. Stanley Bruce, principal County academy, Shelburne, 25 cts. ; Angus M. Swanburg, Shelburne. Yarmouth County : Antoinette Forbes, B.A., County academy, Yarmouth (1895) ; Mrs. E. J. Vickery, 25 cts. ; Mrs. A. J. MacCallum, 25 cts. ; Mary Lovitt, 25 cts. ; Beth Lovitt, 25 cts. ; Ada Goudey, 25 cts. ; Theodosia Goudey, 25 cts. ; Florence Brown, 50 cts. ; Charles E. Brown, 50 cts. ; Miss H. J. Gunn ; Mabel Cann, 25 cts. ; Maude Cann, 25 cts. ; Anne Lovitt, 25 cts. ; Frances L. Allen, 25 cts. ; all of Yarmouth town. Digby County : I. M. Longley, principal County academy, Digby, 25 cts. Annapolis County : Wm. M. MacVicar, M.A., principal County academy, Annapolis. King's County : Prof. A. E. Coldwell, M.A., Acadia college, Wolfville ; Ida Parker, Berwick, 25 cts. Hants County : J. A. Smith, M.A., principal County academy ; Blanche K. McLatchy, N. A. Burgoyne, Helen Bennett, G. L. Borden, and A. E. Dimock, all of Windsor. Cumberland County : E. J. Lay, principal County academy, 25 cts. ; I. C. Craig, inspector of public schools, 50 cts. ;

(life); E. B. Paul, M.A., Agnes D. Cameron, Norman Cuthbert, Wm. Florence Black, 25 cts.; Edith Copp, 25 cts.; Anna Fillimore, 25 cts.; Clara Archibald, 25 cts.; Ethel Tuttle, 25 cts.; Jessie West, 25 cts.; Leah Hockin, 25 cts.; Archibald Murray, 25 cts.; Miss Ford, 25 cts.; N. D. MacTavish, 50 cts. (1896), all of Amherst; T. C. McKay, B.A., principal public schools, Parrsboro', 50 cts.; Mary E. Charman, Wallace, 25 cts. Colchester County: W. R. Campbell, B.A., principal County academy, Truro; Hugh Graham Creelman, B.A., Upper Stewiacke. Pictou County: C. B. Robinson, B.A., County academy; W. A. Hickman, both of Pictou town; Janie Munro, Hopewell, 25 cts. Antigonish County: Prof. D. M. MacAdam, St. Francis Xavier, Antigonish, $1 (1897). Guysboro' County; E. B. Smith, B.A., principal County academy, Guysboro'; E. E. Mack, principal public schools, Canso. Inverness County: Louise M. Paint, Port Hawkesbury, 25 cts. Cape Breton County: Frank I. Stewart, B.A., Sydney academy; Louise MacMillan, North Sydney, 25 cts. Sixty members; $11.

New Brunswick.

St. John County: G. U. Hay, M.A., Ph.B., provincial secretary, St. John, 25 cts.. Charlotte County: J. Vroom, St. Stephen, 25 cts.; H. F. Perkins, Grand Manan, 25 cts. King's County: Edith Darling, Nanwigewauk. Sunbury County: Jas. A. Edmonds, Lauvina, 25 cts. York County: Geo. A. Inch, B.Sc., Fredericton, 25 cts.; Prof. John Britain, Normal school, Fredericton, 25 cts. Albert County: Mrs. L. E. Osman, Hillsboro', 25 cts. Westmoreland County: G. J. Oulton, principal public schools, Dorchester, 25 cts. (1899); Geo. J. Trueman, Point de Bute, 25 cts.; Mary Fawcett, Moncton, 25 cts. Kent County: Isabella J. Caie, Richibucto, 25 cts. Restigouche County: Alex. Ross, B.A., Dalhousie. Thirteen members; $2.75.

Quebec.

Prof. D. P. Penhallow, B. Sc., McGill University, Montreal; Dr. T. J. W. Burgess, superintendent Protestant Hospital for Insane, Montreal (1898); Rev. Robert Hamilton, Grenville; Miss C. M. Derick, Clarenceville (1896): S. W. Mack Salinas, California, U.S.A. (1897). Five members.

Ontario

J. A. Morton, Wingham, provincial secretary (1896); Prof. John Macoun, M.A., Ottawa (1896); James M. Macoun, curator, Herbarium, Geological Survey Department, Ottawa; James Fletcher, Dominion Experimental Farm, Ottawa, $1 (1898); William Scott, science master, Normal school, Toronto, $1 (1897); John E. Wilson, 408 Delaware avenue, Toronto, 25 cts; Rev. Prof. James Fowler, Queen's University, Kingston; J. Dearness, public school inspector, London (1898); James Goldie, Guelph; R. S. Muir, Walkerton; James White, Edmonton; Roderick

Cameron, Niagara Falls, South (1898); Miss A. Pook, Niagara Falls, South, 25 cts Thirteen members; $2.50.

Manitoba.

Winnipeg City: Rev. W. A. Burman, B.D., provincial secretary, 383 Selkirk avenue, 25 cts.; Miss Carruthers, Selkirk avenue E, 25 cts.; Miss Nelson, 515 Notre Dame street, 25 cts.; Miss Fox, Cathedral avenue, 25 cts.; Miss Davis, 301 Austin street, 25 cts.; Miss Waye, 136 Selkirk avenue, 25 cts.; Miss Aitchison, 287 Young street, 25 cts.; Miss Young, 287 Burrows avenue, 25 cts.; Miss Rogers, 140 Edmonton street, 25 cts.; Miss Kennedy, 459 William avenue, 25 cts.; Miss G. Reed, Central school, 25 cts.; Miss O. E. Gray, principal Pembina school, 415 William avenue, 25 cts.; Miss Macdonald, 219 Garry street, 25 cts.; D. McIntyre, superintendent of public schools, 25 cts.; Miss DesBrisay, 330 Ellise street, 25 cts.; Miss M. Christie, 114 Garry street, 25 cts.; Miss Walsh, 369 Graham street, 25 cts.; H. S. Maclean, Esq., 206 Edmonton street, Normal school, 25 cts.; Miss A. B. Stewart, 216 Isabel street, 25 cts.; G. H. Mulvey, principal N. central school, 160 River avenue, 25 cts.; Miss Parsons, 264 King street, 25 cts.; W. A. McIntyre, B.A., principal Normal school, 25 cts.; W. P. Argue, B.A., principal central school, Cauchon street, 25 cts.; J. H. McCarthy, principal south central school, 269 Young street, 25 cts.; A. E. Garratt, 176 Hargrave street, 25 cts.; Miss M. Walker, 64 Aikins street, 25 cts.: Miss Holiday, 230 Smith street, 25 cts. Marquette County: Rev. S. MacMorine, Portage La Prairie, 25 cts. St Francois Xavier: Mrs. Morrison (1898). Twenty-nine members; ($7—$2 provincial expenses)=$5.

Assiniboia.

Lake's End: Rev. George Arthur, B.Sc., acting provincial secretary, 25 cts. Pheasant Forks: Thos. R. Donnelly, acting county secretary, 25 cts. Two members, 50 cts.

Saskatchewan.

Battleford: Rev. C. W. Bryden, provincial secretary; Dr. L. A. Paré, N.W.M.P., P. G. Laurie, H. Richardson, Mrs. G. H. Storer. Prince Albert: Rev. E. K. Matheson. Six members.

Alberta.

Olds: T. N. Willing, provincial secretary, 50 cts. (1896). Calgary: J. J. Morgan, Dr. Macdonald, and Houseman Oldham, committee of Natural Science Club. Red Deer: H. H. Gaetz. Six members; 50 cents.; 50 cents provincial expenses.

British Columbia.

Victoria: A. J. Pineo, B.A., high school, provincial secretary, $5,

Northcott, Francis A. Thomson, John H. McConnell, John L. Colbert, Edward Jack, Ewen Cameron, Henry Boyd, Fred Herd, Harry Pridham, Edward Kermode, W. W. Wilson, Christopher Loat, Paul Renwick, Walter Storey, J. Murray McGregor (59 McClure street), J. N. Larimer, Herman Ohlson, the Misses J. Colquhoun, L. R. Renwick, Edith Byrn (110 Vancouver street), Annie Murray, Nora Denny, Mary Mason, Jane G. Loat, Alice Dalby, M. C. Maclean, C. Macgregor, Pearl Fleming, Minnie Munsie, Beatrice Tobin, Annie Cathcart, Cora Loat, Eva Miller, I. McTaggart, May Duncan, Parker Northcot, Bertie Mason, Rose Jackson, Bessie Morrison, Elizabeth Watson, Rowena Taylor, Lillian McTaggart, Margaret Hiscocks, Kate Braid, Dorothy Allison, Blanche Cowes, I. Leeming, Mabel Sylvester. Vancouver : J. K. Henry, B.A., high school. New Westminster : Mrs. Albert J. Hill, Mrs. Wm. Lee. Hope : Samuel Moore, B.A. Nanaimo : J. E. Norcross, Northfield. Sleuston : Ruyter S. Shorman. Chilliwack : H. B. Turner, Atchelitz. Okanagan Mission : Miss D. M. M. Thomson. Twenty-five cents from each of the fifty-nine members last given. Sixty members. (Fees, $19.75 ; plus sale of booklets, $6 ; plus advanced $2.25 ; equal to provincial expenses, $28). Net receipts negative, $2.25 over-expenditure by provincial secretary in his province.

GENERAL FINANCIAL STATEMENT.

(From 25th May, 1894—last report to Royal Society—to 27th May, 1895—present report to Royal Society.)

1894.		1895.	
May 25—Balance (last report).....	$10 90	Jan. 2—Postage stamps—general correspondence.....	$ 1 00
1895.		" 10—Postage—300 cirulars No. 5 and 600 No. 6.....	3 00
Jan. 31—Disc't printing account...	1 09	" 31—T. C. Allen & Co., Halifax, printing 400 circulars No 5.....	18 83
April 8—Fees, Assiniboia..	0 50	1,000 circulars No. 6....	3 10
" 9— " (gross) British Columbia.....	28 00	April 9—Expenditure Prov. Sec'y British Columbia.....	28 00
" 22—Fees (gross) Alberta.....	0 50	" 9—Over expenditure Prov. Sec'y British Columbia.	2 25
" 27— " " Manitoba...	7 00	" 22—Expenditure Prov. Sec'y Alberta..	0 50
" 30— " Prince Edward Isl'd	0 50	" 27—Expenditure Prov. Sec'y Manitoba.....	2 00
" 30— " Nova Scotia ...	11 00	May 10—T. C. Allen, printing 125 circulars No. 7.....	2 00
" 30— " New Brunswick....	2 75	" 10—Postage, general correspondence	1 00
" 30— " Ontario.....	2 50	" 10—Stationery.....	0 50
		" 27—Balance—Cash on hand..	2 56
May 27.....	$64 74	May 27.....	$64 74

A. H. MACKAY,

General Sec'y-Treas., Botanical Club of Canada.

Halifax, Nova Scotia, 27th May, 1895.

SESSION V. (May 17th.)

Reports of Sections.

The president called upon the four sections to make their usual reports, which are as follows:

Rapport de la Section I.

La première section a l'honneur de faire rapport qu'elle s'est réunie en séances les 15, 16 et 17 mai, sous le présidence de Monsignor Tanguay.

Etaient présents, Joseph Royal, F.-G. Marchand, l'abbé Gosselin, Benjamin Sulte, A.-D. DeCelles, J.-M. LeMoine, Adolphe Poisson, Joseph-Edmond Roy.

MM. Louis Fréchette, Paul de Cazes, Napoléon Legendre, Faucher de Saint-Maurice et M. l'abbé Verreau se sont excusés par écrit.

Les travaux suivants ont été lus et acceptés pour impression :

1. — *Encore un oublié : Le P. de Bonnécamps*, par M. l'abbé A.-H. Gosselin.
2. — *Une famille de robe : les Cugnet*, par M. Joseph-Edmond Roy.
3. — *Généalogie des Barons de Saint-Castin*, par M. de Dufau de Maluquer, juge à Voix, département de l'Ariège. Communiqué par M. Joseph-Edmond Roy.
4. — *Notre littérature*, par M. Napoléon Legendre.

Ont été lus et référés à des comités :

1. — *Histoire des compagnies françaises de commerce*, par le Dr N.-E. Dionne.
2. — *Chronique de la mer*, par M. Faucher de Saint-Maurice.

M. Sulte propose, appuyé par M. DeCelles, que M. Gabriel Gravier, de Rouen, soit nommé membre correspondant de la Société royale, en place de M. Camille Doucet, secrétaire perpétuel de l'Académie française, décédé.

M. Gravier a publié dans le cours des trente dernières années une foule de travaux, dont la plupart ont trait à l'histoire de la Nouvelle-France et de la Louisiane. Son principal ouvrage, *Découvertes et établissements de Cavelier de la Salle*, aussi bien que sa fondation de la Société normande de Géographie, il y a vingt ans, l'ont fait beaucoup remarquer en France, et il est chevalier de la Légion d'honneur à titre d'historien, géographe, etc. Sa dernière publication nous a donné un très beau fac-similé de la carte des grands lacs de l'Amérique du Nord, dressée en 1670 par Bréhan de Gallinée. Ce fac-similé était accompagné d'une brochure remplie de savants commentaires. M. Gravier est du nombre des cinq ou six Français qui étudient l'histoire du Canada et qui l'enrichissent de leurs travaux.

Les élections des officiers donnent le résultat suivant :

Président—M. Joseph Royal,

Vice-président—M. l'abbé A.-H. Gosselin,

Secrétaire—M. Joseph-Edmond Roy (réélu).

Joseph-Edmond Roy, *Secrétaire.*

Cyprien Tanguay, *Président.*

Report of Section II.

The following papers were read before the section:

1.—"A Plan for a General History of the Province of New Brunswick," by W. F. Ganong, M.A., Ph.D. Communicated by Dr. George Stewart, F.R.G.S.

The writer has for several years been preparing to begin a general history of the province of New Brunswick. Compelled for reasons given to alter his intention, he here sketches the complete plan for the work as it has outlined itself, after much trial and selection. It has permanent value, since it represents an adaptation to the historical conditions of that province. It traces first the characteristics of a good local history, and secondly shows the application of these to New Brunswick, and the logic of the division into periods, etc., of its history.

2.—"Religion and Aerolites," by Arthur Harvey, F.S.S.

This is an account of some typical cases of the worship of these bodies, with reasons why, in the investigation of the development of religion, more attention should be given to this branch of nature-worship.

3.—"The Ethics of Literary Originality," by Mr. George Murray, M.A.

4.—"The Canadian Dominion and proposed Australian Commonwealth." A study in comparative politics. By Dr. Bourinot, C.M.G.

This monograph is intended to supplement a series of constitutional studies that have already appeared in the Transactions of the Royal Society. 1. The English character of Canadian institutions. 2. Canada and the United States. 3. The Federal systems of Canada and the United States. 4. Congressional compared with parliamentary government. A summary is here given of the federal constitution of Canada, and of that proposed for Australia, and comments made on the differences in principle and detail. The paper necessarily is a review of the experiences of Canada in working her federal system so far.

5.—"An Iroquois Condoling Council," by Horatio Hale, M.A. (Harvard.)

In this essay the learned author gives an account of the rarest, and by far the most important, ceremony of the Iroquois—their "Condoling Council," at which a deceased chief is publicly lamented, his successor is endowed with his office and title, and is formally received into the Great Council of the League. It is styled by Morgan the "Mourning Council," but Mr. Hale states in his paper that his Iroquois friends prefer his rendering as more clearly expressing the sympathetic nature of the ceremony.

6.—"The present Position of American Anthropology," by Professor John Campbell, LL.D.

7.—"The Proposed Cabot Celebration in Canada in 1897," by Mr. O. A. Howland, M.L.A. of Ontario. Communicated by Dr. Bourinot, C.M.G.

8.—"Notes on a Short Document from Paris, signed by Charles Biencourt," by Rev. Dr. Patterson.

9.—"Pre-historic Man in British Columbia," by Mr. Charles Hill Tout. Communicated by Dr. G. M. Dawson, C.M.G.

The attendance of members was very good. Out of a total of twenty-

four members, fifteen were present. Three meetings of the section were held.

Mr. Archibald Lampman, of Ottawa, was unanimously elected by this section a Fellow of the Royal Society of Canada on motion of Drs. Bourinot and Stewart, and that fact was duly communicated to the Royal Society and ratified.

The printing committee is composed of Dr. Bourinot, Dr. S. E. Dawson and Dr. George Stewart.

It was moved by Dr. Dawson, seconded by Mgr. O'Brien,

That the members of the second section have learned with great satisfaction that Dr. Brymner has ready for publication an abstract of all the documents in London bearing upon the history of the Acadian provinces of the Dominion, and they respectfully recommend that nothing may delay the publication of the abstracts of those important historic records, so long looked for by students of history in the maritime provinces. *Carried.*

It was moved by Rev. Principal Grant, D.D., seconded by Dr. Bourinot, C.M.G.,

That in future, the nomination of members to fill vacancies be not taken up on the first day of the society's session. *Carried.*

It was moved by Rev. Principal Grant, seconded by Dr. John Watson,

That when the author of a paper is unable to be present, he be requested to write a synopsis of it which can be read to the section in fifteen or twenty minutes; and that when this is not done, the paper be not read until all papers whose authors are present have been read. *Carried.*

The office-bearers for the ensuing year are:

President—Dr. J. George Bourinot, C.M.G.

Vice-President—Most Rev. Dr. O'Brien, archbishop of Halifax.

Secretary—Dr. George Stewart, F.R.G.S.

GEORGE STEWART,
Secretary.

Report of Section III.

Section three reports a very successful session, no less than fifteen members being present out of a total membership of twenty, and one of the absent members having contributed a valuable paper.

Four meetings were held, viz., May 15th, 12.30 p.m. and 3.30 p.m., May 16th, 10 a.m., and May 17th, 9 a.m.

Eleven papers were read and important discussions followed. The papers were then referred to the publication committee.

The section passed a unanimous expression of regret at the death of Mr. Carpmael, which was communicated to the family of their late fellow member.

Notice of motion having been given at the first meeting of the

society, and the subject having been referred to section three for consideration, the section reports in favour of the following resolution :

"Having reference to the unification of the nautical and astronomical and civil days, so that all may begin everywhere at midnight, as contemplated by the sixth resolution of the Washington International conference of 1884, and to the present state of the question as set forth in the accompanying memorandum, and having reference to the views of astronomers, that the proposal can, with least difficulty, be carried into effect on the first day of January, 1901, and to the necessity of nautical ephemerides being prepared several years in advance, this society desires to express the opinion that it is in the interests of science and seamen in all parts of the world that a final determination be speedily reached, and hereby requests the council, in the name and on behalf of the society, to adopt such measures as may be considered expedient to bring about the desired result."

The papers read are :

1.—"Note on an Attempt to Measure the Relative Easterly and Westerly Transmission Times through an Atlantic Cable," by Prof. C. H. McLeod.

2.—"On the Estimation of Starch," by Thomas Macfarlane.

3.—"Viscosity in Liquids and Instruments for its Measurement," by Anthony McGill, M.A., presented by Mr. Macfarlane.

4.—"On some Application of DeMoire's Formulæ," by Prof. N. F. Dupuis.

5.—"On the Hypotheses of Abstract Dynamics," by Prof. J. G. MacGregor.

6.—"On the Mirage at Kingston," by Prof. N. F. Dupuis.

7.—"The Chemical Composition of Andradite from two Localities in Ontario," by Prof. B. J. Harrington.

8.—"Note on Secondary Undulations Recorded by Self Registering Tide Gauges and on Exceptional Tides in Relation to Wind and Barometer," by W. Bell Dawson, C.E. Communicated by Prof. Johnson.

9.—"Observations of Temperature Changes of the Soil at various Depths with Electrical Resistance, Thermometers made at the McDonald Physics Building, McGill University, Montreal," by Hugh L. Callendar, M.A., F.R.S.

10.—"The Theory of the Screen in the Photo-Mechanical Process," by E. Deville.

11.—"On the Unification of Civil, Nautical and Astronomical Time," by G. E. Lumsden. Communicated by Dr. Sandford Fleming.

The officers elected for the year 1895-96 are :

President—Prof. Bovey.

Vice-President—Prof. Dupuis.

Secretary—E. Deville.

E. Deville,
Secretary.

Report of Section IV.

Section four has held four meetings in all, at which there were fourteen members present. Ten papers in all were read, of which only two were presented by title. Although the amount of work accomplished has been much less than on former occasions, the papers have all possessed a high degree of value as the outcome of original research. In this connection it should be stated that the general sentiment of the section is opposed to the occupation of so large a portion of the time given to the work of the general society by routine business, operating, as it does, to seriously impair the efficiency of the work accomplished by the sections.

Feeling that the present conditions of faulty administration are incompatible with the great interests involved, the section appointed a committee to inquire into the subject, with a view to securing co-operative action on the part of local governments, and the adoption of measures which should tend to the conservation of our timber resources and natural water supply. The following report, which was unanimously adopted, is therefore presented, with the request that it be forwarded to the government, with such representations as may be deemed advisable :

" The Royal Society of Canada respectfully represents that under existing conditions there is great and needless waste of one of our greatest sources of national wealth, through the destruction of timber by fire and other causes, while the removal of large forest areas seriously threatens the efficiency and continuance of the water supply. Under these circumstances, the Royal Society would respectfully recommend that immediate action be taken looking to the establishment of a proper administration of the remaining timber lands, so that the timber resources of the country may be more economically managed, and the perpetuity of the forest cover in those districts where streams have their origin be maintained, in order that the continuity of the water supply may be assured ; and that for the carrying out of this object, the society would recommend the appointment of a permanent forestry commissioner to inquire into and administer the various interests involved.

" D. P. Penhallow.
" P. J. W. Burgess.
" Wm. Saunders.
" Robert Bell."

A review of attendance and of papers read by members shows that during the thirteen years the society has been in operation there has been a display of zeal not only in the actual operation of the sessions, but also in the promotion of scientific research rarely equalled by similar societies elsewhere. At the present time the section has its full quota of members, twenty-five. Of the original twenty members, fourteen are still on the rolls and actively engaged in important lines of work. The following

summary statement of the work and attendance of members now in the section may serve to encourage those who are disposed to be doubtful of our work, and will serve as a definite basis for the future compilation and preservation of more accurate records than have been kept in the past.

SUMMARY OF ATTENDANCE AND PAPERS, SEC. IV., 1892-1894.

—	Date of Election.	Total Meetings.	Attendance.	Papers Presented.
Bailey, L. W	1882	13	13	12
Bell, Dr. Robert	1882	13	9	9
Bethune, Rev. C. J. S	1892	3	2	..
Burgess, Dr. P. J. W	1885	10	3	1
Dawson, Dr. G. M	1882	13	10	9
Dawson, Sir J. W	1882	13	12	18
Ells, Dr. R. W	1893	2	2	2
Fletcher, J	1885	10	10	4
Fowler, Rev. J	1891	4	2	..
Gilpin, E	1882	13	7	6
Grant, Sir James	1882	13	9	1
Harrington, W. H	1894	1	1	1
Hay, G. U	1894	1	1	1
Laflamme, Abbé	1882	13	9	10
Lawson, Dr. G.	1882	13	6	10
Mackay, A. H	1888	7	4	1
Macoun, Prof. J	1882	13	8	6
Matthew, G. F	1882	13	13	18
Mills, Dr. T. W	1890	5	5	1
Penhallow, Prof. D. P	1885	10	7	7
Saunders, Prof. W	1882	13	10	10
Selwyn, Dr. A. R. C	1882	13	12	3
Taylor, Rev. G. W	1894	1	..	..
Whiteaves, J. F	1882	13	13	16
Wright, R. R	1882	13	3	2
Totals	.....	236	171	148
Percentage of attendance	.....	.....	72·4	.....

Respecting the establishment of a biological station in Canada, the section feels that it has insufficient information on which to base a definite recommendation, and would ask that consideration be deferred until next year in order that inquiries may be made and the expediency of the measure more carefully inquired into.

Election of officers for the next year resulted as follows :

President—Dr. T. W. Mills.

Vice-President—Prof. D. P. Penhallow.

Secretary—Dr. P. J. W. Burgess.

The committee on publication report a recommendation to publish all papers read at the present session of the section, together with one by Mr. Lambe presented at the last annual meeting, but not published.

D. P. Penhallow,
Secretary.

Dr. S. E. Dawson presented the following report from the Cabot committee :

"Your committee to whom was referred the question of a commemoration of the four hundredth anniversary of the discovery of the continent of America by John Cabot have met and beg to report as follows :

"That in view of the fact that all the available resources of the society are already appropriated in carrying on its necessary work, it is unadvisable for the Royal Society of Canada to enter upon any extensive plan involving heavy responsibilities ;

"That, nevertheless, it is the duty of the society in some way to commemorate an event of such surpassing historical importance, and the committee recommend that the annual meeting for the year 1897 be held at Halifax on Monday, June 21, and that, after transacting the usual business, an excursion be made to Sydney, and from thence to the most eastern point of the island of Cape Breton ; the details of such excursion to be reported upon at the next annual meeting of the society ;

"That on the occasion of the excursion above referred to the foundation-stone of some permanent monument should be laid ; and that the spot upon the island of Cape Breton selected for such monument, and its design and cost, be reported upon at the next annual meeting of the society.

"Your committee furthermore report :

"That at a meeting of members held, by kind permission of his excellency the governor-general, at government house, on Thursday, the 16th instant, O. A. Howland, Esq., delegate of the Canadian Institute, Toronto, attended and laid before the meeting an extended plan of a great historical commemorative exposition to be held at Toronto, in connection with the contemplated meeting of the British Association in that city, in September of the same year, which plan is fully set forth in a

paper read in section two, to be published in the Transactions of the present year;

"That the plan proposed by Mr. Howland in no way clashes with the preceding recommendation of your committee; the scheme is one of a broad national character, which the Royal Society should approve and support with its sanction and encouragement;

"Your committee therefore recommend that delegates be appointed to represent the Royal Society in any body which may be organized for the purposes of getting up a grand national historical exposition to commemorate the discovery of the continent of America in 1497, and that the delegates shall have no power to commit the society to any definite plan, but shall report at the next annual meeting."

The following resolutions were adopted:

Moved by Dr. Sandford Fleming, seconded by Sir William Dawson,

(1.) "*Resolved*, That having reference to the unification of the nautical, astronomical and civil days, so that all may begin everywhere at midnight as contemplated by the sixth resolution of the Washington International Conference of 1884, and to the present state of the question as set forth in the accompanying memorandum, and having reference to the views of astronomers that the proposal can, with least difficulty, be carried into effect on the first day of January, 1901, and to the necessity of nautical ephemerides being prepared several years in advance, the Royal Society desires to express the opinion that it is in the interests of science and seamen in all parts of the world that a final determination be speedily reached, and hereby requests the council, in the name and on behalf of the society, to adopt such measures as may be considered expedient to bring about the desired result."

(2.) "*Resolved*, That the committee, with respect to the Cabot celebration in 1897, be further empowered to make full inquiries into the subject and submit a full report thereon at the next meeting." (On motion of Archbishop O'Brien, seconded by Principal Grant.)

(3.) "*Resolved*, That Dr. Bourinot, Rev. Dr. Clark, Principal Grant, Lieut.-Col. Denison, Dr. Ellis, Dr. Sandford Fleming and Prof. Ramsay Wright, be nominated delegates to represent the society in any body which may be organized to promote a great historical exposition at Toronto in 1897, and that said delegates shall report at the next annual meeting." (Moved and seconded as in previous motion.)

The following notice of motion was referred to the council with power to inquire into the whole subject of election of members, on the understanding that the decision of the council (if any) should be communicated to the members of the society before the next general meeting:

"That in any contest for the election of fellows, should no candidate receive the requisite number of votes, the council may elect such mem-

ber or members as it may deem best qualified, at any meeting of the council held before the date fixed for the annual meeting, provided a quorum of members of council be present." On motion of Prof. Bovey, seconded by Prof. Penhallow.)

Election of Officers for 1895–96.

The Royal Society then proceeded to the election of officers of the society for 1895-96 (May) and the following gentlemen were unanimously elected :

President—Dr. A. R. C. Selwyn, C.M.G., F.R.S.
Vice-President—Archbishop O'Brien, D.D.
Honorary Secretary—Dr. Bourinot, C.M.G.
Honorary Treasurer—James Fletcher, Esq.. F.L.S.

Conclusion of Business.

The following resolutions were adopted :

(1.) "*Resolved*, The Royal Society of Canada express their hearty appreciation of the hospitalities so graciously extended to the fellows and delegates by their excellencies the governor-general and the Countess of Aberdeen." (On motion of Dr. Stewart, seconded by Dr. Johnson.)

(2.) "*Resolved*, The Royal Society of Canada desire to express their deep appreciation of the hospitality extended to them by the citizens of Ottawa during the present session." (On motion of Prof. Penhallow, seconded by Dr. Harrington.)

(3.) "*Resolved*, The Royal Society of Canada express their obligations to Dr. MacCabe for the facilities he has given to its members in the normal school building on the occasion of the present meeting." (On motion of Prof. Penhallow, seconded by Dr. Mills.)

The thirteenth general meeting of the Royal Society then adjourned.

PUBLIC MEETINGS.

On the evening of May 16th Professor Cox, M.A. (Cantab.), of McGill University, delivered an able address before a large audience on "Unsolved Problems in the Manufacture of Light," with the aid of the apparatus generously loaned for the occasion by the governors of the university.

On the evening of the 17th a public meeting was held in the Assembly Hall, and a number of poems were read by Canadian poets. Professor Clark, president of the second section, English literature, acted as chairman. In introducing the poets on the platform he paid high tribute to their merit, and deprecated the assertions sometimes made, that Canada was lacking in material for the poet's pen.

The first poem read was "The Passing of Père La Brosse," composed by Miss Machar. Miss Machar was present, but the poem was read by Principal Grant. J. D. Edgar, M.P., followed by reading a few lyrics by Mr. John Reade. "The Tree," composed by Mrs. Harrison, and found in her published book of poems, "Pine, Rose and Fleur de Lis," was read by Mr. Duncan Campbell Scott. Mr. Scott also read one of his own poems, "The Reaper and the Angel." He also read "The Last Watch," composed by Mr. Bliss Carman.

Miss Pauline Johnson was expected to read her poem, "The Song my Paddle Sings," but recited instead, being dressed in Indian costume.

Mr. Archibald Lampman read C. G. D. Roberts's poem, "Recessional," also two of his own poems, "At the Ferry" and "*Inter Vias.*" Archbishop O'Brien read "A Midnight Threnody," one of the many poems of which he is author. Rev. F. G. Scott read two of his own productions, "A Song of Triumph" and "Samson." J. D. Edgar, M. P., rendered his poem, "The White Stone Canoe."

N. F. Davin, M. P., recited his poem, "An Ode to Canada." Mr. W. W. Campbell read his poems, "Pan the Fallen" and "The Humming Bee," and the programme concluded by Miss Johnson reciting "Beyond the Blue" very effectively.

Lord Aberdeen proposed, and Hon. G. W. Ross seconded a vote of thanks to the poets and the chairman, Prof. Clark, and the meeting closed

REGULATIONS

OF THE

ROYAL SOCIETY OF CANADA.

(AS REVISED TO MAY, 1895.)

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1. *Objects of the Society.*

The objects of the society are set forth in the preamble of the act of incorporation as follows: first, to encourage studies and investigations in literature and science; secondly, to publish transactions annually or semi-annually, containing the minutes of proceedings at meetings, records of the work performed, original papers and memoirs of merit and such other documents as may be deemed worthy of publication; thirdly, to offer prizes or other inducements for valuable papers on subjects relating to Canada, and to aid researches already begun and carried so far as to render their ultimate value probable; fourthly, to assist in the collection of specimens with a view to the formation of a Canadian museum of archives, ethnology, archæology and natural history.

2. *Name.*

By the gracious permission of Her Majesty the Queen, the society will bear the name of the Royal Society of Canada, and the members shall be entitled "Fellows of the Royal Society of Canada."

3. *Honorary President and Patron.*

His Excellency the Governor-General shall be the honorary president and patron of the society.

4. *Division into Sections.*

The society shall consist of the four following sections:

1. French Literature, with History, Archæology and allied subjects.
2. English Literature, with History, Archæology and allied subjects.
3. Mathematical, Chemical and Physical Sciences.
4. Geological and Biological Sciences.

The sections may meet separately for the reading and discussion of papers, and for business, at such times and places as may be fixed by the sections under the control of the council.

5. *Officers.*

The officers of the society shall be a president and vice-president, with an honorary secretary and a treasurer, to be elected by the whole society; besides a president, vice-president and secretary of each section, to be elected by each section. The elections shall be annual.

The council of the society shall consist of the officers so elected, and of ex-presidents, during three years from the date of their retirement from the office of president, and of such ex-members of the council, not exceeding four in number, as may be selected by the council itself. The ex-members, so elected, shall continue in office for three years, and afterwards until successors are appointed.

6. *Members.*

The Fellows shall be persons resident in the Dominion of Canada, or in Newfoundland, who have published original works or memoirs of merit, or have rendered eminent services to literature or to science.

The number of members in each section shall be in general limited to twenty, but may be increased if any section should so desire, in the manner hereinafter indicated. Nominations to fill vacancies in any section may be made at any time in writing by any three members of that section, and the nomination papers shall be lodged with the honorary secretary, who shall make a record of them. When the vacancy occurs, the honorary secretary shall notify the members of the section in which it has taken place, and transmit to each a printed list of the candidates nominated, at least four months before the annual or any general meeting of the society. Each member may then place a mark (×) opposite the name of the candidate for whom he votes, and return the voting paper to the honorary secretary, who shall report to the council at a meeting, to be held at least two months before the annual meeting, the number of votes obtained by each candidate. Should any of these have obtained a majority of the whole section, the council shall so report to the society. Should this result not be attained, then the council may select one or more of the candidates obtaining the highest number of votes of the section, and cause the members of the society to be advised of the names of the candidates so selected, at least one month previous to the date of the annual meeting, when the election may take place by vote of the members present, or the matter be referred back to the section concerned, to select names from among the candidates nominated, and recommend them to the society for election. This selection and recom-

mendation by the section shall be made on the first day of the meeting at 2.30 p.m., unless otherwise ordered at that time by the section. If there be two or more vacancies the selection shall be made by a separate vote for each vacancy.

Each section shall have power to increase its number by electing one new member annually. The proposal to elect an additional member shall be made by nominations in the usual manner, but each member of the section shall have the opportunity of voting against the election of an additional member absolutely ; and if the majority of votes be against the election of an additional member, then no such member shall be elected for that year. This clause shall cease to operate as soon as the total number in any section shall have reached twenty-five.

7. *Duties of Members.*

Members shall sign the regulations of the society, shall be presented by the president to the society at a general meeting of the same, shall attend its stated meetings or send reasons of absence to the honorary secretary, and shall pay an annual subscription of $2.00 or the sum of $20.00 in one payment in commutation of the same for life membership. These payments shall entitle members to receive the Transactions of the society.

Any member may withdraw from the society, and the society may, by resolution in general session on the recommendation of the council. grant to such member the privilege of retaining his title, and his name shall thenceforward be entered on the lists as a retired member retaining title.

Any member failing to attend three years in succession, without presenting a paper, or assigning reasons in writing satisfactory to the society, shall be considered to have resigned.

8. *Corresponding Members.*

The society may elect by baliot on proposal by three members, or on recommendation of the council, persons not resident in Canada as corresponding members. Such persons must be eminent in literature or science, and evidence to that effect must be presented to the society at the time of their proposal or recommendation. The number of corresponding members shall be limited to sixteen.

That in acting under rule 8 of the constitution, four of the corresponding members shall be elected for each section ; and the name or names proposed, the names of the proposers, and the reasons in writing, shall be announced to the society through the honorary secretary, at least one day before the balloting for any such corresponding member. (Resolution of May, 1884.)

9. *Meetings.*

The society shall hold an annual meeting in such city of the Dominion as it may determine from time to time. It may at any annual meeting appoint other meetings to be held in the course of the year. The time of holding the annual meeting shall be on a day or days to be determined at the next previous meeting, or, failing this, by the council. The offices of the society shall be in the city of Ottawa, and its meetings shall be held in that city unless otherwise determined.

10. *Papers.*

The title of any paper, memoir or other production, by a member, intended to be read at a meeting of the society, shall be submitted, together with an abstract of its contents, to the council, through the secretary, previous to the meeting at which it is to be read. On its approval, each such communication shall be assigned to the section to which it belongs, and having been therein read and discussed, shall be submitted to a committee of the section, and on report of said committee may be recommended to the council for publication, either entire or in abstract, in the Transactions of the society. Communications by persons not members of the society may be submitted by members on the same conditions as their own productions.

11. *Associated Societies.*

Every scientific or literary society in the Dominion which may be selected by vote of the society shall be invited by circular of the honorary secretary to elect annually one of its members as a delegate to the meetings of the society, such delegate to have, during his term of office, the privilege of taking part in all general or sectional meetings for reading and discussion of papers, and to be empowered to communicate a short statement of original work done and papers published during the year by his society, and to report on any matters in which the Royal Society may usefully aid in publication or otherwise.

12. *Circulation of Transactions.*

Copies of the Transactions of the society shall be sent to the following :

All members who have paid their subscriptions.

All associated societies.

Such foreign societies as may be selected by the council.

The lieutenant-governors of the provinces of the Dominion and Newfoundland.

The members of the Privy Council of Canada.

The chief justice and judges of the Supreme Court of Canada.

The speakers of the Senate and House of Commons.

The chief justice of each province.

The premier of each province.

The speakers of the legislatures of each province.

The minister or superintendent of education in each province.

The universities, the library of parliament and the libraries of provincial legislatures.

13. *Duties of Council.*

The council shall manage all the affairs of the society in the intervals of its meetings, and shall make arrangements for the meetings. It shall meet at the call of the president. Three members shall be a quorum.

The council shall report its proceedings at each meeting of the society for sanction.

The council shall have the custody and disposal of all moneys, collections and other property of the society, subject to sanction of its proceedings as above.

In the absence of the president and vice-president, the council may appoint a temporary chairman, and in the case of vacancy of the office of honorary secretary or treasurer may appoint a temporary secretary or treasurer to hold office till the next meeting of the society.

14. *Duties of the Honorary Secretary.*

The honorary secretary shall keep the minutes of the society and council, and shall conduct their correspondence, shall receive and attend to all nominations for members and officers of sections, shall keep the lists and records of the society, and, under advice of the president, shall attend to any business that may arise in the intervals of meetings. He may, with consent of the council, delegate any part of his duties to a paid assistant appointed by the council.

15. *Duties of the Treasurer.*

The treasurer shall have the custody of all moneys of the society, shall keep account of the same and submit these to the council at its meetings, and shall receive subscriptions, grants and donations, and make disbursements as shall be ordered by the council.

16. *Addresses and Special Reports.*

It shall be the duty of the president, or in event of his being unable to do so, of the vice-president, to prepare an address for each annual meeting.

It shall be the duty of the president of each section, or in event of his being unable to do so, of the vice-president, to prepare an address, having reference to the special objects of the section, for each annual meeting.

The society in general session, or any of the sections, with consent of the society, may appoint committees to prepare reports on any special literary or scientific matters, or on the progress of literature and science, or on works published in Canada, and to suggest such honorary notice as may seem desirable in the case of meritorious works or researches.

The ordinary committee of the section shall be limited to three in number, and consist of the officers of the section or any members that the section may select to make up the number.

17. *Reading of Papers.*

I.—The representatives of each section in the council shall be the judges of the papers to be accepted or rejected. No paper shall be read in any section, at any general meeting of the society, unless it has been presented, either in full or in abstract, at least three weeks before the first day of the meeting, and formally accepted by the council, in accordance with rule X. of the society, except by special permission of the council. The publication of any paper not so accepted, as having been read before or presented to it, may be disavowed by the society.

II.—No paper already published shall be accepted by the society except in cases where it shall have been entirely recast.

III.—A programme containing the titles of papers to be read shall be printed and sent to the members of the society at least one week before the time of meeting.

IV.—It shall be the duty of the secretaries of each section to prepare before each day's meeting a list of the papers to be presented to each section, with the names of the authors and the time demanded for their reading. These lists shall be printed and made public each morning before the time fixed for the meeting.

18. *Publication of Papers.*

I.—The author shall revise his MS. after reading, to prepare it for the press.

II.—The first proof in galley shall be sent to the author, and also a revise in galley.

III.—The matter shall then be put in page, and a proof sent to the secretary of the section to which it belongs, who will sign the proof when he has corrected it. Should the author demand it, he may see a proof in page.

IV.—The chairman of the printing committee or his deputy will

sign the final revise, and will see that conformity in headings and in type is observed.

V.—If the authors of papers are to be absent in places not accessible without delay, they shall indicate some person by whom the proofs shall be read, failing which the secretary of the section shall be responsible for their reading and correction.

VI.—If, from the absence of the author, the proof of a paper cannot be read by him, and he has named no representative, and if the secretary will not read it, the printing committee shall not delay the volume for the author's return, but shall omit the paper.

VII.—All matter in the French language shall be read for literal errors by a French proof-reader skilled in the typographic art, and familiar with the present usage in France.

19. *Amendments to Constitution or Rules.* (*Adopted Session of 1893*).

Members having motions to propose for a change in the constitution or regulations of the society, shall give notice thereof one month before any general meeting, and the secretary shall prepare a printed list of such notices, and submit it to the members on the first day of the meeting.

No rule or regulation of the society shall be suspended, except with the consent of two-thirds of the Fellows present at a meeting.

THE ROYAL SOCIETY OF CANADA.

FOUNDER: THE RIGHT HONOURABLE THE MARQUESS OF LORNE.

OFFICERS FOR 1895-96.

HONORARY PRESIDENT:

HIS EXCELLENCY THE RT. HON. THE EARL OF ABERDEEN.

PRESIDENT—A. R. C. SELWYN, C.M.G., F.R.S., LL.D.
VICE-PRESIDENT—MOST REV. ARCHBISHOP O'BRIEN, D.D.

OFFICERS OF SECTIONS:

SEC. I.—French Literature, History, and Allied Subjects.

PRESIDENT, ... J. ROYAL.
VICE-PRESIDENT, ... L'ABBÉ GOSSELIN.
SECRETARY, ... J. E. ROY.

SEC. II.—English Literature, History, and Allied Subjects.

PRESIDENT, ... DR. BOURINOT, C.M.G.
VICE-PRESIDENT, ... ARCHBISHOP O'BRIEN, D.D.
SECRETARY, ... GEO. STEWART, JUN., D.C.L., LL.D.

SEC. III.—Mathematical, Physical, and Chemical Sciences.

PRESIDENT, ... PROF. BOVEY.
VICE-PRESIDENT, ... PROF. DUPUIS.
SECRETARY, ... E. DEVILLE.

SEC. IV.—Geological and Biological Sciences.

PRESIDENT, ... DR. WESLEY MILLS.
VICE-PRESIDENT, ... PROF. D. P. PENHALLOW.
SECRETARY, ... DR. BURGESS.

HONORARY SECRETARY, ... J. G. BOURINOT, C.M.G., LL.D., D.C.L. D.L.
HONORARY TREASURER, ... JAMES FLETCHER, F.L.S.

ADDITIONAL MEMBERS OF COUNCIL:[1]

SANDFORD FLEMING, C.M.G., LL.D.
ABBÉ J. C. K. LAFLAMME, D.D.
SIR J. W. DAWSON, C.M.G., F.R.S.
DR. G. M. DAWSON, C.M.G., F.R.S.
J. M. LEMOINE.

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[1] The Council for 1895-96 comprises the President and Vice-President of the Society, the Presidents, Vice-Presidents and Secretaries of Sections, the Honorary Treasurer, besides ex-Presidents of the Society (Rule 7) during three years from the date of their retirement, and any four members of the Society who have formerly served on the Council, if the Council should elect them every year.

THE ROYAL SOCIETY OF CANADA.

LIST OF MEMBERS, 1895-96.

I.—LITTÉRATURE FRANÇAISE, HISTOIRE, ARCHÉOLOGIE, ETC.

BÉGIN, MGR L.-N., Archevêque de Cyrène, *Québec.*
CASGRAIN, L'ABBÉ H.-R., docteur ès lettres, *Québec* (ancien président).
CUOQ, L'ABBÉ, *Oka, P.Q.*
DAVID, L.-O., *Montréal.*
DECAZES, PAUL, docteur ès lettres, *Québec.*
DECELLES, A.-D., docteur ès lettres, *Ottawa.*
DIONNE, N.-E., *Québec.*
FABRE, HECTOR, compagnon de l'ordre des SS. Michel et George, *Paris, France,*
FAUCHER DE SAINT-MAURICE, N., docteur ès lettres, chevalier de la légion d'honneur, *Québec.*
FRÉCHETTE, LOUIS, docteur en droit, docteur ès lettres, chevalier de la légion d'honneur, *Montréal.*
GOSSELIN, L'ABBÉ AUGUSTE, docteur ès lettres, *St-Charles de Bellechasse, P.Q.*
LEGENDRE, NAPOLÉON, docteur ès lettres, *Québec.*
LEMAY, PAMPHILE, docteur ès lettres, *Québec.*
LEMOINE, J.-M., ancien président, *Québec.*
MARCHAND, F.-G., docteur ès lettres, *Saint-Jean, P.Q.*
POISSON, ADOLPHE, *Arthabaskaville, P.Q.*
ROUTHIER, A.-B., docteur en droit et ès lettres, *Québec.*
ROY, JOSEPH-EDMOND, *Lévis, P.Q.*
ROYAL, JOSEPH, *rue St-Denis, Montréal.*
SULTE, BENJAMIN, *Ottawa.*
TANGUAY, MGR CYPRIEN, docteur ès lettres, *Ottawa.*
VERREAU, L'ABBÉ HOSPICE, docteur ès lettres, *Montréal.*

II.—ENGLISH LITERATURE, HISTORY, ARCHÆOLOGY, ETC.

BOURINOT, JOHN GEORGE, C.M.G., LL.D., D.C.L., D.L. (Laval), *Ottawa* (ex-President).
BRYMNER, DOUGLAS, LL.D., Dominion Archivist, *Ottawa.*
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SOCIÉTÉ ROYALE DU CANADA

MÉMOIRES

SECTION I

LITTÉRATURE FRANÇAISE, HISTOIRE, ARCHÉOLOGIE, ETC.

ANNÉE 1895

I. — *Morel de la Durantaye*

Par M. BENJAMIN SULTE

(Lu le 16 mai 1894)

Un homme qui a servi dans l'armée durant quarante ans, qui a consacré ses loisirs et son énergie à coloniser le Canada, durant un demi-siècle, mérite une place dans la galerie historique du pays. J'ai donc cru bien faire en étudiant ce qui concerne Olivier Morel de la Durantaye, un type du cadet de famille, pauvre et courageux, attentif au devoir, cherchant à se procurer le bien-être par le travail et mettant toutes ses espérances dans l'avenir du nouveau pays. Voyons d'abord ses origines, à commencer par la pièce suivante qui est restée inédite :

" Extrait des registres de la chambre établie par le roy pour la réformation de la noblesse du païs et duché de Bretagne par lettres patentes de Sa Majesté du mois de février dernier vérifiées au Parlement.

" Entre le Procureur général du Roy, demandeur, d'une part, et François Morel, escuier, Sieur de la Chaussé, défendeur, d'autre part.

" Vue par la ditte chambre extrait de présentation faite au greffe d'icelle par le procureur du dit défendeur ce quinzième jour de septembre au dit an 1668, contenant sa déclaration de soutenir la qualité d'Ecuier par ses prédécesseurs prise, et qu'il produira l'écusson de ses armes avec ses titres, le dit écusson par le dit défendeur produit par son Induction : qui est d'*argent à un léopard passant de gueules*, et lequel défendeur déclare qu'il est fils d'Ecuier Thomas Morel, puisné d'Ecuier Julien Morel, Sieur de Grémil, tous deux enfants de Pierre Morel, fils de feu François Morel, qui était fils de Pierre Morel, fils de Charles, aussi fils de Guillaume, fils d'Alain Morel, Sieur de la Corbière et de Damoiselle Guillemette Huet, et que le dit Alain Morel qui portait la seigneurie de la Corbière était du dit lieu de la Corbière, en la paroisse de Gouvray, Evêché de Saint-Brieuc.

" Que Pierre Morel, son troisième petit-fils, bisayeul du produisant, étant à la suite et comme l'un des Gentilshommes du Seigneur de Rohan, épousa en premières noces Damoiselle Urseline Hubert, Dame de la Viollais, près Blain, et en second mariage Damoiselle Guillemette de Carduel, de la maison de Greneil (ou Gremil), de la paroisse de Saffré, et que Alain Morel, son huitième devancier en droite ligne il se (illisible) que après sa mort Ecuier Guillaume Morel, aussi Sieur de la Corbière, qui épousa Damoiselle Jeanne du Parc, comme leur fils ainé, héritier principal et noble fournit es-mains au receveur du due pour la prescription du rachat en 1441, et que en 1448 le dit Guillaume Morel fût convoqué et

employé en la réformation des nobles. Extrait de minu levé en la chambre des comptes le 17 juin 1623 avec une requête du 14 du dit mois, sur laquelle fut permis de se pourvoir en la dite chambre. Cinq actes : la première du 26 mars 1469 en laquelle le dit Charles est qualifié fils de Guillaume, la seconde est un extrait que exerça le dit Charles en qualité d'Ecuyer, héritier principal et noble du dit Guillaume du 15 et 17 octobre 1480, et les trois autres actes des 12 mai 1483, le 12 novembre 1486, et 3 février 1487 qui font voir la qualité de noble et Ecuier, Seigneur de la Corbière, les dits actes dûment signés et garantis. Contrat de vente à condition raquit du 15 mars 1515, par lequel Pierre Morel, Sieur de la Couvossière est qualifiée d'Ecuier (fils) de Charles Morel et Isabeau Le Baillager,[1] le dit contrat signé et garanti. Trois quittances baillées par le dit Pierre Morel à Ecuier Julien Morel, Gilles Morel, son neveu, fils de Tristan, son frère ainé, de certaines de rentes lui dues au pays de Camballe et de Moncontour des 28 août 1540, 16 juin 1541, et 12 mars 1542 ; un acte de compte du 9me jour de juin 1550 fait entre Guillaume du Cormene, procureur du dit Pierre Morel, Ecuier, Sieur de la Couvossière, et le dit Gilles, Sieur de Caumay, son neveu ; le dit acte passé à Moncontour. Acte de partage baillé par Tristan, ainé, héritier principal et noble de Charles, et Robert décédé sans hoirs de corps, auquel partage se voit que le dit Tristan croyant la succession du dit Pierre assurée retint sa portion ; le dit partage du 23 mai 1531, signé et garanti. Acte de testament de Robert Morel, Ecuier, Sieur du Pré Vallon, du 6 novembre 1563, par lequel il institue son héritier principal et noble le dit Gilles, son neveu, fils du dit Tristan, et légue aux héritiers du dit Pierre, son frère, lors décédé, une somme de 150 livres. Acte de supplément de partage fait par le dit Gilles en la dite qualité d'héritier principal et noble de Tristan, à Damoiselle Gilette Morel, sa sœur, du 14 septembre 1562 ; et un *minu* rendu par le même Gilles au décès de Damoiselle Isabeau Le Boulanger, son ayeule, de la terre de Caunay, cottée. Compte rendu par Ecuier Claude du Carduel, Seigneur du Grémil, tuteur du dit feu Morel, à Ecuier François Denays, Sieur de la Pervanchère, son curateur, de la gestion des biens des successions des dits Pierre Morel et Guillaumette de Carduel, ses père et mère, du dernier avril 1556. Acte d'accord passé entre Pierre Morel qualifié d'Ecuier, fils unique, seul héritier du dit feu Morel, Sieur de la Couvossière, et le Sieur Simon avec lui et Damoiselle sa mère Picard, veuve du dit feu Sieur Morel, le dit acte du 7 juillet 1586. Contrat d'acquit de la maison de Grémil du 2 mai 1597, auquel le dit Pierre Morel est qualifié d'Ecuier, Sieur du Bois Gaudin. Deux partages de 2 et 5 mai 1596 auxquels le dit Pierre Morel est employé comme en plusieurs autres partages en qualité de priseur noble, les dits actes signés et garantis. Acte du grand du bien en la succession de Pierre Morel fourni par Julien Morel, fils ainé, héritier

[1] Plus loin c'est le Boulanger.

principal et noble, à Thomas Morel et autres, ses frères et sœurs, du 15 mai 1619. Contrat de mariage du 13 janvier 1631, passé entre Ecuier Thomas Morel et Damoiselle Alliette du Houssay, fille d'Ecuier Louis du Houssay, Sieur de la Lande Carvissaye et de défunte Damoiselle Renée Le Royer, sa femme. Acte de transaction et partage du 9 novembre 1655, qui fait voir que le dit Morel, Ecuier, Sieur de la Chaussée, produisant, est fils du dit Thomas. Sentence rendue au Présidial de Nantes du 10 septembre 1627 entre Bertrand Le Tour Beillon, Ecuier, Sieur de la Hunaudière, contre Julien Morel, aussi Ecuier, Sieur de Grémil, frère ainé de Thomas, père du produisant, et sur la contestation faite au dit Sieur de Grémil par le dit Sieur Les Tour Billan de la dite qualité d'Ecuier, il en fût débouté et le dit Grémil conservé en la dite qualité, de laquelle sentence ayant été appel du dit Sieur de Lestourbeillan, elle fût confirmée par arrêt de la Cour rendu entre les dites parties le 9 juin 1628 avec adjudication des dépens.

" Induction des dits actes ci-dessus cottés et produites par le dit Morel, défendeur, par laquelle induction il conclut à ce qu'il fût maintenu en la qualité d'Ecuier et en tous les autres privilèges et prérogatives de noblesse comme étant issu d'ancienne extraction noble et ordonné qu'il sera employé au catalogue des autres nobles du ressort de Nantes, la dite induction signée, François Morel et signifié au Procureur général du roi le 26 octobre 1668. Conclusion du dit Sieur Procureur général du roi tendant à ce que le dit Sieur de la Chaussée fût déclaré noble et d'extraction noble et en conséquence maintenu en la dite qualité d'Ecuier et comme tel mis au catalogue qui sera fait pour la sénéchaussé de Nantes, les dites conclusions du dit 31 octobre 1668. Et tout considéré, la chambre faisant droit sur l'instance a déclaré et déclare le dit François Morel noble et issu d'extraction noble, et comme tel lui a permis et à ses descendants en mariage légitime de prendre la qualité d'Ecuier et l'a maintenu au droit d'avoir armes et écussons timbrés appartenant à sa qualité, et à jouir de tous droits, franchises, préeminences et prévilèges attribués aux nobles de cette province ; et ordonne que son nom sera employé au rôle et catalogue des nobles de la Sénéchaussée de Nantes. Fait en la dite chambre à Rennes, le 14 novembre 1668. Ainsi signé en la grosse : Malecot."

" La copie de l'arrêt de la cour ci-dessus a été bien et fidèlement collationnée par nous, Louis Charets, Ecuier, Sieur de la .... Conseiller du Roi, Sénéchal de la cour et siége Présidial, ville et comté de Nantes, ayant pour adjoint maître Jean Le Boucher, Premier Commis ordinaire de la dite Cour, sur la grosse originale écrite en parchemin donnant garantie, à nous présentées par François Morel, Ecuier, Sieur de la Chaussée, et à lui rendue avec la présente pour foi y être ajoutée comme à la dite grosse originalle et servir ainsi qu'il appartiendra et y avons fait apposer le sceau de cette Cour. Fait à Nantes, le 22 Février 1685. (Signé), Louis Charets, François Morel, Le Boucher."

De l'ensemble des papiers que nous possédons maintenant on peut

tirer la conclusion que cette famille remonte à Alain Morel, seigneur de la Corbière, qui vivait en 1400. Celui-ci était originaire de la Corbière, paroisse de Gouvray, diocèse de Saint-Brieux, en Bretagne ; sa femme se nommait Guillemette Huet. Morel et Huet sont deux noms encore fréquents dans cette partie de la France. La famille se maintint en Bretagne, posséda plusieurs seigneuries, et la branche qui nous occupe se trouva représentée en 1619 par Thomas Morel, sieur de la Durantaye, lequel épousa, en 1631, Alliette, fille de Louis de Houssay, écuyer, sieur de la Lande Carvissaye, de Notre-Dame de Gaure, diocèse de Nantes, en Bretagne. Gaure est un village de trois cents âmes actuellement, situé dans le département de Maine et Loire, commune de Varennes sur Monsereau. En Flandre et en Gascogne il y a aussi deux localités du nom de Gaure.

De Thomas Morel et d'Alliette Houssay naquirent : 1° François, sieur de la Chaussée,[1] qui fit souche en France ; 2° Olivier, sieur de la Durantaye, auteur de la branche canadienne. Voici les actes qui concernent la naissance et le baptême de ce dernier :[2]

" L'an 1685, le jeudi, vingt-deuxième jour de février, par devant nous, Louis Charetez, écuier, seigneur de la Gasserie, conseiller du roi, sénéchal de la Cour et Siège Présidial, Ville et Comté de Nantes, ayant pour adjoint maître Jean Le Boucher, premier commis ordinaire de la dite Cour, est comparu, Ecuier François Morel, sieur de la Chaussée, demeurant en la ville et franchise du Gaure, évêché de Nantes, faisant et disant pour Olivier Morel, écuier, sieur de la Durantaye, *son oncle*,[3] résidant à présent à Québec, en Canada,[4] lequel lui ayant écrit avoir besoin de l'extrait de son baptême dûment légalisé pour justifier qu'il est issu du sieur Thomas Morel, frère de François Morel, écuier, sieur de la Chaussée, qui ayant produit ses titres justifiant qu'ils sont d'extraction noble devant les Commissaires pour la Réformation de la noblesse de Bretagne, il y a été maintenu par arrêt,[5] de sorte qu'il s'est pourvu vers le recteur du Gaure, qui lui a... dans lequel le Baptistaire du dit sieur de la Durantaye est inserré qu'il a réputé lui délivrer le dit extrait pour en servir ainsi qu'il appartiendra.

" De laquelle comparution et Réquisitoire, nous avons... que le dit Sieur de la Chaussée Morel nous a représenté un livre relié... sur lequel sont insérés les Baptêmes qui ont été faits dans l'Eglise du Gaure depuis

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[1] On trouvera plus tard ce nom porté par un fils de notre la Durantaye.

[2] Nous les empruntons à l'article de M. de Léry-Macdonald publié dans le *Monde*, de Montréal, du 30 septembre 1893. Ils n'avaient jamais été imprimés avant cette date.

[3] François Morel de la Chaussée était fils de François Morel de la Chaussée, frère de notre Olivier Morel.

[4] Olivier Morel de la Durantaye, commandant de Michillimakinac de 1683 à 1690, passa l'hiver de 1684-85 à Québec, alors que les pièces ci-dessus se préparaient en France.

Nous l'avons cité en commençant.

le douzième septembre 1631 jusqu'au premier mars 1650 sur le 49me feuillet duquel *verso* nous avons vu écrit l'article qui suit : "Le vingt-troisième jour de mai 1641 a reçu les bénédictions Ecclésiastiques et avait ci-devant été essentiellement baptisé, etc... et nommé Olivier, fils à Ecuier Thomas Morel, Sieur de la Durantaye et Damoiselle Alliette du Houssay, sa compagne ; Parain Me Olivier Dillayer et Maraine Damoiselle Anne Morel, et... *femme* [?] Guillaume Tescier ; et fut le dit Olivier né le 17 février 1640.[1] Dillayer, Morel, Anne Morel, Julien *Douminil* [?] Ptre." Lequel extrait nous certifions véritable pour avoir été lu de mot à autre sur l'original... auquel nous avons délivré la juste copie pour foi y être ajouté comme à l'original et servir ainsi qu'il appartiendra. Fait le dit jour et an que devant, et signé : François Morel, Louis Charetez et Boucher."

Vers 1662, c'est-à-dire avant que d'avoir atteint l'âge de vingt-deux ans, M. de la Durantaye obtint un grade d'enseigne dans les troupes royales. Il est probable qu'il entra de suite ou passa bientôt au régiment de Chambellé, lequel tenait son nom de Sidrac de Chambellé, maréchal des camps et armées, lieutenant de roi à Dunkerque et gouverneur de Béthune. Trois ou quatre autres officiers du régiment de Chambellé furent versés plus tard dans celui de Carignan lorsque ce dernier corps s'organisa pour la Nouvelle-France.

Après la guerre de Hongrie contre les Turcs, qui se termina par le traité de septembre 1664, les douze ou quinze régiments français envoyés au secours de l'Autriche rentrèrent dans leur patrie et furent licenciés, mais l'un d'eux, placé sous la protection du prince de Carignan et commandé par le colonel de Salières, reçut ordre de se reconstituer en recrutant parmi les officiers et soldats des troupes congédiées du service. Ceci nous explique pourquoi des officiers et des soldats du régiment de Carignan arrivés en Canada, sont mentionnés comme appartenant à d'autres corps des troupes françaises. Le régiment débarqua à Québec, par deux, trois et quatre compagnies ensemble, de juin à août 1665. Il fut échelonné par petites divisions, à Trois-Rivières, Sorel, Chambly, et vers le lac Champlain, pour se préparer à la campagne contre les Iroquois des environs d'Albany, ce qui eut lieu durant les mois de février et mars 1666.

M. de la Durantaye servait en Canada, avec le régiment de Carignan mais à titre de lieutenant au régiment de Chambellé, comme le témoigne le brevet suivant mis au jour par M. de Léry-Macdonald :

"Louis par la grâce de Dieu Roi de France etc., à notre cher et bien-aimé le capitaine Ladurantaye, salut : La compagnie qu'avait le capitaine *Couvran* (?) dans le régiment de l'infanterie de Chambellé étant à présent vacante par sa mort et désirant la remplir d'une personne qui s'en puisse

[1] Le recensement de 1681 donne trente-sept ans à M. de la Durantaye, ce qui le ferait naître en 1644, date que Mgr Tanguay a adoptée, ne possédant pas de document plus précis.

bien acquitter nous avons estimé ne pouvoir faire pour cette fin un meilleur choix que de vous pour les services que vous nous avez rendus dans toutes les occasions qui s'en sont présentées, même dans la charge du Lieutenant de la dite compagnie que vous avez depuis plusieurs années ou vous avez donné des preuves de votre valeur, courage, expérience en la guerre, vigilance et bonne conduite, et de votre fidélité et affection à notre service. A ces causes et autres à ce nous mouvant nous vous avons commis, ordonné et établi, commettons, ordonnons et établissons par ces présentes signées de notre main, capitaine de la dite compagnie vaccante comme dit est ci-dessus, laquelle vous commanderez, conduirez et exploiterez sous notre autorité et sous celle du colonel du dit Régiment. Qu'à part et ainsi qu'il vous sera par nous ou nos Lieutenants Généraux, commandé et ordonné pour notre service, et nous vous ferons payer, ensemble les officiers, et soldats de la dite compagnie, des états, appointements et soldes qui vous seront et à eux dues suivant les montres et raisons qui en seront faites par les Commissaires et Conseillers des Guerres et de départir tant et si longuement que la dite compagnie sera sur pied pour notre service, tenant la main à ce qu'elle vive en si bon ordre et police que nous n'en puissions recevoir des plaintes. De ce faire vous donnons pouvoir, commission, autorité et mandement spécial. Mandons au Sieur de Chambellé, Colonel du Régiment de vous faire reconnaître en cette qualité et à tous qu'il appartiendra qu'à vous en ce faisant soit obéi. Car tel est notre plaisir. Donné à Paris, le dixième jour de Décembre, l'an de grâce mil six cent soixante-cinq et de notre règne le vingt-troisième. (Signé) Louis (Par le Roi), Le Tellier.[1] "

Né le 17 février 1640, M. de la Durantaye était donc âgé de vingt-cinq ans et dix mois près, lorsqu'il atteignit le grade de capitaine. N'oublions pas, toutefois que, dans le titre de la seigneurie de Kamouraska, le 15 juillet 1674, Frontenac dit que "le sieur de la Durantaye est venu en ce pays capitaine d'une compagnie du régiment de Carignan." N'y aurait-il pas un léger malentendu dans ces expressions, ou bien la Durantaye agissait-il comme capitaine dès son arrivée en Canada ?

Après la marche infructueuse des troupes contre les bourgades vides des Agniers, le capitaine Pierre de Saint-Paul sieur de Lamothe fut chargé de construire un fort, sur une île, à quatre lieues de l'extrémité nord du lac Champlain ; c'était au printemps de 1666 ; M. de la Durantaye fut son principal officier en cette occasion et commandait une compagnie.[2] L'automne suivant, l'armée française partit de là (le fort Sainte-Anne) pour aller de nouveau combattre les Iroquois, et cette fois elle atteignit son but. Après cette seconde expédition, qui fut suivie d'une paix stable de quinze

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[1] Michel le Tellier, secrétaire d'Etat au département de la guerre, 1643-66. Son fils Louvois lui succéda.

[2] Dollier de Casson : *Histoire du Montréal*, pages 188-191.

à seize ans, M. de la Durantaye demanda la permission de repasser en France.[1]

Les officiers militaires n'avaient nullement de goût pour un pays sauvage dont la seule chance de développement consistait dans l'agriculture, et encore fallait-il commencer par abattre la forêt, "faire de la terre neuve," entreprise formidable aux yeux des Européens, aussi peut-on affirmer qu'il y eut bien des désappointements sous ce rapport parmi ceux du régiment de Carignan qui virent la Nouvelle-France pour la première fois en 1665. La condition expresse de se fixer dans le Canada après avoir terminé la guerre contre les Iroquois ne semble pas avoir été imposée au départ de ce régiment pour la colonie, en 1665, mais que la chose ait été implicitement comprise il n'y a pas à le mettre en doute, et il est probable que la majeure partie des soldats seraient restés ici, retenus par divers motifs, sans l'intervention inattendue de la politique royale. Louis XIV voyait, en 1667, que les Hollandais ne souffriraient pas toujours sans se plaindre et agir, les actes de hauteur qu'il se permettait à leur égard et, silencieusement, il prenait des mesures pour reconstituer son armée, qu'il avait réduite au minimum en 1664. Le régiment employé au Canada devait avoir quelque valeur à ses yeux, puisque tous les hommes qui le composaient étaient d'anciens militaires, ayant déjà l'habitude des armes, des marches, des combats, des campements et de la discipline. A cette époque, il n'existait que quatre ou cinq régiments réguliers dans tout le royaume ; en cas de guerre, on en créait de nouveaux. L'appoint de douze ou quatorze cents hommes dressés au service n'était donc pas une bagatelle. Le roi agit en conséquence. Aussi, dès 1669, il ne restait plus en Canada que les compagnies de la Motte-Lucière et la Durantaye. En 1670, on nous envoya de France un certain nombre de soldats pour remplacer ceux qui étaient retournés de 1667 à 1668, et l'on continua l'année suivante à recomposer l'effectif nécessaire aux garnisons ; mais ces nouveaux venus ne devaient pas être très aguerris et, d'ailleurs, peut-on les regarder comme les soldats primitifs du régiment de Carignan ?

D'après les témoignages les plus autorisés, il serait resté en Canada quatre cents hommes de troupes qui sont devenus Canadiens. Or, c'est à peine s'il y en avait une centaine de cette classe en 1670, appartenant au groupe de 1665 ; ceux qui sont venus en 1670-72 peuvent représenter, si l'on veut, trois cents autres individus—mais alors ne les qualifions pas tous universellement du titre de soldats de Carignan. L'ensemble des opérations de 1665 à 1672 a fait croire aux historiens qu'il s'agissait toujours du même régiment, mais n'oublions pas que les cadres (surtout les sous-officiers) étaient repassés en France et que les contingents reçus en 1670-72 par la colonie n'avaient plus rien de commun avec l'ancien régiment. On commençait à établir le système qui a prévalu jusqu'en

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[1] M. l'abbé François Daniel : *Aperçu sur quelques Contemporains*, p. 35.

1754, c'est-à-dire l'entretien d'un simple détachement que le ministère de la marine prit à sa solde, sans que le bureau de la guerre eût à s'en occuper. Faute d'avoir compris cette situation, la plupart de nos écrivains ont erré sur la question. Un major commandait ce détachement.

M. de la Durantaye revint en 1670, si je ne me trompe, accompagnant les premières escouades, et tout me porte à croire qu'il voulait se fixer dans le pays, car dès le 14 septembre de cette même année, il se mariait à Québec avec Françoise Duquet, née à Québec le 7 novembre 1645, veuve du chirurgien Jean Madry, lequel était décédé en juillet 1669. M. de la Durantaye et sa femme vécurent à Québec de 1670 à 1683.

L'automne de 1672, lorsque eut lieu la grande distribution des seigneuries en bois debout, il en reçut sa part par un acte dont voici les passages importants :

"Sa Majesté (le roi Louis XIV)—ayant de tout temps recherché avec soin et le zèle convenable au juste titre de fils ainé de l'Eglise, les moyens de pousser dans les pays les plus inconnus, pour la propagation de la foi et la publication de l'Evangile, la gloire de Dieu avec le nom chrétien, fin première et principale de l'établissement de la colonie française en Canada, et, par accessoire, de faire connaître aux parties de la terre les plus éloignées du commerce des hommes la grandeur de son nom et la force de ses armes et n'ayant pas estimé qu'il y en eût de plus surs que de composer cette colonie de gens capables de la bien remplir par leurs travaux et leur application à la culture des terres, à la soutenir par une vigoureuse défense contre les insultes et les attaques auxquelles elle pourrait être exposée dans la suite des temps—a fait passer en ce pays bon nombre de ses fidèles sujets, officiers de ses troupes dans le régiment de Carignan et autres, dont la plupart, conformément aux grands et pieux desseins de Sa Majesté, voulant bien se lier au pays en y formant des terres et seigneuries d'une étendue proportionnée à leurs forces, et le sieur de la Durantaye, capitaine d'une compagnie d'infanterie au dit régiment, nous ayant requis de lui en départir : Nous, en considération des bons, utiles et louables services qu'il a rendus à Sa Majesté en différents endroits, tant en l'ancienne France que dans la Nouvelle depuis qu'il y est passé par ordre de Sa Majesté, et encore de ceux qu'il témoigne vouloir rendre ci-après—en vertu du pouvoir qu'elle nous a donné, avons accordé au dit sieur de la Durantaye, la quantité de deux lieues de terre de front, sur autant de profondeur, à prendre sur le fleuve Saint-Laurent, tenant d'un côté à un demi-arpent au-delà du saut qui se trouve sur la terre du sieur des Islets et de l'autre le canal Bellechasse..."

La pièce est signée de l'intendant Talon ; elle est datée de Québec le 29 octobre 1672. C'est le titre de la seigneurie de la Durantaye, dite aussi Bellechasse.[1] J'y vois une phrase assez significative : "à la charge

[1] *Titres seigneuriaux*, p. 151.

qu'il continuera de tenir et de faire tenir feu et lieu sur les concessions qu'il accordera." Ceci veut bien dire que, déjà en 1672, M. de la Durantaye avait commencé des travaux sur ce fief.[1]

Le 8 mai 1673, le nouveau seigneur se plaignait "qu'ayant donné verbalement à plusieurs particuliers des concessions sur sa terre de la Durantaye, à condition d'y tenir feu et lieu dans l'an," ces personnes auraient abandonné leur projet, le Conseil Souverain ordonna que, après trois mois, si les colons ne se présentaient pas, les terres seraient accordées à d'autres qui les demandaient. Une affiche devait, en conséquence, être posée à la porte de l'église de Québec.[2]

Le 15 juillet 1674, il reçut la patente de la seigneurie de Kamouraska, dans laquelle est mentionnée la pêche sédentaire qu'il avait établie par permission de l'intendant en date du 30 octobre précédent. Le fief de 1672 fut augmenté de deux lieues en profondeur, en 1693, et en 1696 on donna à M. de la Durantaye deux autres lieues de front au fleuve.[3] De tous les officiers du régiment de Carignan, M. de Saint-Ours est celui qui a reçu le plus de terres : 98,784 arpents. Ensuite vient M. de la Durantaye : 70,560 arpents. Ils n'en restèrent pas moins pauvres tous deux.

Ayant sa paye d'officier, il pouvait vivre à Québec et y élever sa famille, ce qu'il fit, comme on le verra par la suite, mais nous ne savons si, par lui-même ou par sa femme, il possédait des ressources pécuniaires dont il pouvait disposer pour aider les colons à mesure que ceux-ci occupaient ses terres. Il est probable que ses déboursés dans cette direction furent assez minces ; en revanche il sut admirablement choisir les gens destinés à peupler sa double seigneurie.

En 1673, il employe le terme *la Durantaye* pour désigner le fief, mais au recensement de 1681, celui-ci est partagé en deux groupes, portant chacun un nom, et ils viennent sur la liste dans l'ordre géographique suivant : Lauzon, cap Saint-Claude et Beaumont, *la Durantaye*, *Bellechasse*, la Bouteillerie, l'Isle-aux-Oyes. Voici le recensement de 1681 :

La Durantaye.

François Rouillard (Rémillard), 31 ans ; Anne Gaboury, sa femme, 15 ans ; 1 fusil, 1 vache, 5 arpents de terre en valeur.

Etienne Corriveau, 38 ans ; Catherine Guillebaud (Bureau), 30 ans ; enfants : Jacques, 10 ans, Catherine, 7 ans, Etienne, 5 ans, Geneviève, 2 ans ; 10 arpents.

Nicolas le Roy, 37 ans ; Jeanne Lelièvre, 40 ans ; enfants : Guillaume,

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[1] Un autre officier, Paul de Morel, enseigne de la compagnie de la Motte au régiment de l'Estrade, reçut un fief du séminaire de Saint-Sulpice, à la pointe nord de l'île de Montréal, le 7 décembre 1671.

[2] *Jugements du Conseil Souverain*, I, 742.

[3] *Titres seigneuriaux*, pp. 23, 410, 425.

14 ans, Elisabeth, 10 ans, Jean, 8 ans, Baptiste, 3 ans ; 1 fusil, 8 bêtes à cornes, 20 arpents.

Louis le Roy, 23 ans ; 1 fusil, 3 arpents.

Nicolas le Roy, 20 ans ; 1 fusil, 2 arpents.

Louis Gaboury, 45 ans ; Nicole Soulard, 45 ; enfants : Louis, 14 ans, Jean, 9 ans, Henriette, 6 ans, Françoise, 3 ans ; 3 bêtes à cornes, 10 arpents.

Louis Marien, 28 ans ; Marie-Françoise Philipot, 19 ans ; enfants : Anne, 4 ans, Catherine, 1 an ; 1 fusil, 5 arpents.

Charles Davene, 45 ans ; Marie de Noyon, 38 ans ; enfants : Gabriel, 9 ans, Charlotte, 6 ans, Madeleine, 4 ans, Françoise, 10 mois ; 3 arpents.

Michel Gautron, 35 ans ; 2 arpents.

Pierre Balan, 35 ans ; Renée Barette (Birette), 40 ans ; enfants : Marie, 8 ans, Jean, 5 ans, Henriette, 4 ans, Michel, 2 ans, René, 5 mois ; 2 bêtes à cornes, 2 arpents.

François Paquet, 35 ans ; Anne Philippe, 28 ; enfant : Marie, 4 ans ; 1 vache, 7 arpents.

Julien Boissel, 30 ans ; Françoise Grosse-Jambe, 25 ans ; enfants : Nicolas, 4 ans, Jean, 1 an ; 1 fusil, 5 bêtes à cornes, 13 arpents.

David Lacroix, 34 ans ; Barthélemie Maillou, 20 ans ; 3 bêtes à cornes, 12 arpents.

René Vendet, 35 ans ; Marie Loriot, 35 ans ; enfant : René un an et demi ; 3 bêtes à cornes, 8 arpents.

Michel Maillou, 40 ans ; Jeanne Mercier, 35 ans ; enfants : Jeanne, 7 ans, Marie, 5 ans, Henriette, 3 ans, Françoise, 14 mois ; 1 fusil, 3 bêtes à cornes, 12 arpents.

Jean le Janvre, 60 ans.

Bellechasse.

Pierre Bazin, 35 ans ; Marguerite Leblanc, 25 ans ; enfants : Pierre, 10 ans, Jean, 8 ans, Marie, 7 ans, François, 4 ans, Louis, 2 ans ; 1 fusil, 17 bêtes à cornes, 6 arpents.

Jean Daneau, 44 ans ; Marie Chauveau (Michault ?), 34 ans ; enfants : Jacques, 10 ans, Marguerite, 7 ans, Marie, 5 ans, Pierre, 2 ans ; 1 fusil, 2 bêtes à cornes, 6 arpents.

Pierre Duval, 35 ans ; 1 fusil, 1 vache, 8 arpents.

Pierre Lemieux, 30 ans ; 1 fusil, 5 arpents.

Paul d'Erainville (de Rainville), 61 ans ; Marie Michelle, 61 ans ; 1 fusil, 6 arpents.

Joachim Gasnier, 20 ans ; 1 fusil, 5 bêtes à cornes, 6 arpents.

Guillaume Fournier, 60 ans ; Françoise Hébert, 46 ans ; enfants : Joseph, 20 ans, Jean, 16 ans, Simon, 14 ans, Pierre, 12 ans, François, 11 ans, Louis, 9 ans, Madeleine, 6 ans, Charles, 4 ans ; 3 fusils, 12 bêtes à cornes, 10 arpents.

Alphonse Morin, 30 ans ; Marie Normand, 30 ans ; enfants : Alphonse, 11 ans, Pierre-Noël, 10 ans, Joseph, 7 ans, Catherine, 4 ans, Jean, 2 ans ; 2 fusils, 7 bêtes à cornes, 6 arpents.

Nicolas Sarasin, 30 ans ; Marie Blondeau, 18 ans ; enfants : Joseph, 1 ans ; 1 fusil, 2 bêtes à cornes, 4 arpents.

Jean Proust, 34 ans ; Jaquette Fournier, 22 ans ; enfants : Denis, 6 ans, Jean, 4 ans, Louise, 2 ans, Pierre, 4 mois ; 1 fusil, 12 bêtes à cornes, 6 arpents.

Jean Rollandeau, 30 ans ; Marie Thibaud, 18 ans ; 2 fusils, 1 vache, 6 arpents.

Pierre Blanchet, 35 ans ; Marie Fournier, 26 ans ; enfants : Pierre, 10 ans, Guillaume, 8 ans, Madelaine, 6 ans, Jacques, 4 ans, Angélique, 2 ans ; 1 fusil, 7 bêtes à cornes, 8 arpents.

Pierre Jonqua, 33 ans ; Jacqueline Boulé, 23 ans ; enfants : Pierre, 8 ans, Jacqueline, 4 ans, Jean, 2 ans ; 1 fusil, 4 bêtes à cornes, 4 arpents.

Jacques Posé, 38 ans ; Marie Jobidon, 25 ans ; enfants : Marie, 6 ans, Jacques, 4 ans, Jean, 1 an ; 2 fusils, 7 bêtes à cornes, 10 arpents.

Robert Boulé, 50 ans ; Françoise Grenier, 44 ans ; enfants : Jacques, 17 ans, Pierre, 12 ans, Martin, 9 ans, Françoise, 7 ans, Robert, 4 ans, Jean, 2 ans ; 1 fusil, 6 bêtes à cornes, 5 arpents.

Geneviève des Prés, (veuve de Louis Couillard de Lespiné) 40 ans ; enfants : Louis, 18 ans, Geneviève, 17 ans, Jacques, 16 ans ; Pierre, domestique, 46 ans ; 1 fusil, 2 carabines, 5 bêtes à cornes, 10 arpents.

Nicolas Gamache, 45 ans ; Ursule Cloutier, 20 ans ; enfants : Louis, 3 ans, Nicolas, 2 ans ; Charlotte Cloutier, sœur, 10 ans ; Jean, domestique, 12 ans ; 2 fusils, 9 bêtes à cornes, 10 arpents.

Eustache Fortin, 25 ans ; 1 fusil, 3 arpents.

Louis Gasnier, 42 ans ; Louise Picard, 22 ans ; enfants : Louise, 4 ans, Alexis, 1 an ; Mathurin, domestique, 12 ans ; 2 fusils, 18 bêtes à cornes, 10 arpents.

Pierre Gasnier, 32 ans ; Louise Faure, 45 ans ; enfants : Pierre, 11 ans, Jean, 10 ans, Joachim, 7 ans, François, 6 ans, Marie, 5 ans, Louis, 2 ans ; 2 fusils, 10 bêtes à cornes, 14 arpents.

Robert Caumons, (Gaumont) 40 ans ; Louise Robin, 40 ans ; enfants : Louise, 9 ans, Germain, 7 ans.

Pierre Richard, 34 ans ; 2 fusils, 1 vache, 8 arpents.

Jean Gottereau, 27 ans ; 1 fusil, 6 arpents.

Pierre Caron, 27 ans ; 1 fusil, 4 bêtes à cornes, 4 arpents.

Jean Couillard, 22 ans ; Geneviève de Chavigny, 40 ans ; enfants : Joseph, 16 ans ; domestiques : Louis, 30 ans, Pierre, 25 ans, Guillaume, 21 ans ; 2 fusils, 15 bêtes à cornes, 20 arpents.

Jacques Bernier, 46 ans ; Antoinette Garnier, 47 ans ; enfants : Pierre, 22 ans, Marie, 20 ans, Charles, 18 ans, Jacques, 16 ans, Jean, 14 ans, Elisabeth, 12 ans, Geneviève, 10 ans, Philippe, 8 ans, Ignace, 6 ans, Antoinette, 3 ans ; 1 fusil, 8 bêtes à cornes, 10 arpents.

Nicolas Bouchard, 44 ans ; Anne le Roy, 28 ans ; enfants : Angélique, 8 ans, Agnès, 6 ans, Nicolas, 4 ans, Anne, 2 ans ; 1 fusil, 2 vaches, 5 arpents.

François Thibaud, 34 ans ; Elisabeth Lefebvre, 26 ans ; enfants : Elisabeth, 8 ans, Jean 5 ans, François, 3 ans, Anne, 2 ans ; 1 fusil, 4 bêtes à cornes, 5 arpents.

Guillaume Ferté, 34 ans ; 1 fusil, 6 arpents.

Nicolas Durand, 26 ans ; 1 fusil, 2 arpents.

Joseph Caron, 26 ans, charpentier ; 1 fusil, 2 arpents.

Charles Fortin, 25 ans ; 1 fusil, 4 arpents.

François Guion, 28 ans ; 1 fusil, 2 arpents.

Guillaume Guion, 26 ans ; 1 fusil, 2 bêtes à cornes, 4 arpents.

François Bélanger, 60 ans ; Marie Guion, 55 ans ; enfants : Geneviève, 21 ans, Jacques, 18 ans ; domestiques : Jean de Lavoye, 17 ans, Barthelemy Gobeil, 14 ans, Pierre Lafaye, 56 ans, Pierre Mataule, 4 ans ; 5 fusils, 3 bêtes à cornes, 4 arpents.

Philippe des Trois-Maisons, 44 ans, cordonnier ; Martine Cronier, 36 ans ; enfants : Angélique, 10 ans, Marie, 9 ans, Françoise, 8 ans, Marguerite, 7 ans, Philippe, 6 ans, François, 5 ans, Louise, 2 ans ; 5 bêtes à cornes, 4 arpents.

René Cloutier, 30 ans ; Marie Leblanc, 27 ans ; enfants : Louise, 5 ans, Louis, 3 ans, Jean, 1 an ; 1 fusil, 9 bêtes à cornes, 6 arpents.

Jean-François Bélanger, 30 ans ; Marie Cloutier, 28 ans ; enfants : Marie, 8 ans, Jean, 9 ans, Charles, 4 ans, Ignace, 1 an ; 2 fusils, 12 bêtes à cornes, 6 arpents.

Louis Bélanger, 27 ans ; 1 fusil, 6 arpents.

Olivier Michel, 30 ans ; Marie-Madeleine Cochon, 27 ans ; enfants : Marie, 8 ans, Jean, 7 ans, Guillaume, 6 ans, Joseph, 5 ans, Charles, 4 ans, Louis, 2 ans ; 2 fusils, 6 bêtes à cornes, 4 arpents.

Guillaume Lizot, 36 ans ; Anne Pelletier, 25 ans ; enfants : Françoise, 10 ans, Nicolas, 8 ans, Anne, 6 ans, Noël, 4 ans, Marie, 2 ans, Françoise, 1 an ; 4 fusils, 13 bêtes à cornes, 10 arpents.

Jacques Grondin, 35 ans ; Xaintes Mignault, 30 ans ; enfants : Marie, 10 ans, Agnès, 8 ans, Louise, 6 ans, Xaintes, 4 ans, François, 2 ans ; 1 fusil.

René Ouellet, 32 ans ; Thérèse Mignault, 32 ans ; enfants : Angelique, 8 ans, Nicolas, 6 ans, Joseph, 4 ans, Marie, 2 ans, Joseph, 1 an ; 1 fusil, 7 bêtes à cornes, 6 arpents.

Nicolas Huot, 52 ans ; Marie Fayet, 40 ans ; enfants : Marie, 16 ans, Geneviève, 14 ans, Madeleine, 12 ans, Charlotte, 10 ans, Laurent, 8 ans, Joseph, 6 ans, Nicolas, 4 ans, Françoise, 2 ans ; 1 fusil, 6 bêtes à cornes, 7 arpents.

Noël Pelletier, 27 ans ; Madeleine Mignault, 27 ans ; enfants : Noël, 5 ans, Charles, 2 ans, Guillaume, 1 an ; Grégoire, domestique, 11 ans ; 1 fusil, 4 bêtes à cornes, 5 arpents.

Pierre Saint-Pierre, 38 ans ; Marie Gilbert, 22 ans ; enfants : Marie, 2 ans, Madeleine, 1 an ; 1 fusil, 6 bêtes à cornes, 3 arpents.

Jean Pelletier, 56 ans ; Anne Langlois, 48 ans ; enfants : René, 25 ans, Jean, 18 ans, Marie, 15 ans, Charles, 10 ans, Marie, 7 ans ; 1 fusil, 9 bêtes à cornes, 5 arpents.

(Ensuite vient la Bouteillerie.)

Tous les colons de la Durantaye paraissent avoir été recrutés autour de Québec :—

François Rémillard, avait épousé, à l'Ilet, le 7 mai 1681, Anne, fille de Louis Gaboury, ci-dessous nommé.

Etienne Corriveau, de Fontereau, diocèse d'Angoulême, s'était marié, à l'île d'Orléans, 1669, avec Catherine Bureau, de Saint-Jean, diocèse de Paris.

Nicolas Roy et sa femme s'étaient mariés en 1658, à Sainte-Thérèse de Dieppe et, en 1665, on les trouve à Château-Richer. Il était âgé de quarante-sept ans et non pas de trente-sept ans en 1681. Louis et Nicolas Roy ou le Roy, qui occupaient deux terres voisines de la sienne, étaient ses fils.

Louis Gaboury dit le Major, marié en France, 1660, était avec sa femme à l'île d'Orléans, dès 1666.

Louis Marien, de Garde, diocèse d'Angoulême, marié, à Québec, 1676, avec Françoise, fille de Claude Philippaux. Ce dernier était en Canada avec sa famille, dès 1669.

Charles Davenne, dit le Bellet, ville de Dieppe, marié, à Château-Richer, 1670, avec Marie de Noyon.

Michel Gautron dit Larochelle, de la ville de la Rochelle, marié, à Québec, 1673, avec Catherine Poisson, de Saint-Paul de Paris, était devenu veuf, sans enfants ; il se remaria et fonda une famille à Bellechasse.

Pierre Balan dit Lacombe, de Catilan de Périgueux, avait épousé, à Québec, 1672, Renée Birette, de la Rochelle.

Julien Boissel dit Lagrillade, de Sainte-Croix, diocèse de Luçon, avait épousé, à Québec, 1671, Françoise Grosse-Jambe, de Saint-Germain-en-Laye, diocèse de Paris.

David Lacroix, de Confollant, diocèse de Poitiers, marié, à Québec, 1671, avec Antoinette Buteau, avait épousé en secondes noces, le 20 janvier 1681, Marie-Barthélemie, fille de Michel Mailloux nommé plus bas.

René Vandé, de Montournoy, diocèse de Maillezais, en Poitou, s'était marié, à Québec, 1671, avec Marie Hariot, de Saint-Martin, diocèse de Chartres, Beauce.

Michel Mailloux, de Bourg, en Brie, marié en 1666, avec Jeanne Mercier.

Il en est de même de ceux de la seigneurie de Bellechasse :

Pierre Bazin, de Saint-Thomas de Tour, diocèse de Lisieux, marié, à Québec, 1670, avec Marguerite Leblanc, née à Québec.

Jean Daniaux, de Saint-André, ville de Niort, diocèse de Poitiers,

marié, à Québec, 1670, avec Marie-Louise Michault, de Bourg-le-Vilay, diocèse de Sens.

Paul de Rainville, de Touques, en Normandie, était en Canada dès 1665 ; en secondes noces, 1669, il avait épousé Marie Michelle, veuve de Louis Gasnier.

Joachim Gasnier ou Gagné, qui vient ensuite, était fils de Louis Gasnier ici nommé. Il épousa, à Beauport, le 12 janvier 1682, Louise Marcoux, et demeura à Beauport jusqu'à son décès, en 1688.

Guillaume Fournier, de Coulme, en Normandie, marié, à Québec, 1651, avec Françoise Hébert, qui lui apporta une partie du fief de la paroisse de Saint-Charles, près Québec. Ils avaient trois enfants mariés avant 1681.

Alphonse Morin dit Valcour, né à Québec, avait épousé Marie-Marguerite Normand, fille d'un bourgeois de Paris et probablement parente du notaire Gilles Rageot.

Nicolas Sarazin, médecin, né à Paris, 1655, marié, à Charlesbourg, le 23 avril 1680, avec Catherine Blondeau, née à Québec. Michel Sarazin, médecin et savant distingué, qui vint s'établir au Canada vers la fin du même siècle, était natif de la Bourgogne.

Jean Prou, de Mantilly, diocèse d'Angers, marié, à Québec, 1673, avec Jacquette Fournier, fille de Guillaume çi-dessus nommé.

Jean Rolandeau, du bourg de Marsilly, diocèse de la Rochelle, avait épousé, à Québec, le 24 avril 1680, Marie Thibault, dont la famille était à Sillery dès 1666.

Pierre Blanchet, de Saint-Omer de Rosière, diocèse d'Amiens, Picardie, avait épousé, à Québec, 1670, Marie, fille de Guillaume Fournier çi-dessus nommé.

Pierre Joncas dit Lapierre, de Morin, évêché de Lombès, en Gascogne, avait épousé, à l'île d'Orléans, 1672, Jacqueline Boulé, dont la famille habitait la côte de Beaupré dès 1663. Voir plus bas.

Jacques Posé, de Saint-Sauveur, diocèse de la Rochelle, s'était marié, à Québec, 1678, avec Marie Jobidon, veuve de Michel Isabel et de Pierre Rouillard ; la famille Jobidon était établie à Château-Richer depuis au moins 1650.

Robert Boulé était le père de madame Joncas çi-dessus nommée.

Madame veuve Louis Couillard appartenait à une famille déjà ancienne dans le pays.

Nicolas Gamache, de Saint-Ilier, diocèse de Chartres, avait épousé, à Château-Richer, 1676, Elisabeth-Ursule Cloutier, née en Canada. Il fut seigneur de l'Islet.

Eustache Fortin, né en Canada, à fondé une famille nombreuse à Bellechasse et au cap Saint-Ignace.

Louis Gagné dit Bellavance, sieur de la Frênaie, né en Canada, avait épousé, à Sainte-Anne, 1673, Louise Picard, née à Québec.

Pierre Gagné, aussi né dans le pays, avait épousé Louise Faure, vers 1669.

Robert Gaumont, de Saint-Pierre de Charençon, de Paris, avait épousé, à Québec, 1671, Louise Robin, de Saint-Sébastien, diocèse de Coutance, en Normandie.

Jean Gottereau, de la Flote, diocèse de la Rochelle, s'était marié, à Québec, le 31 juillet 1678, avec Marie le Roy, née dans le pays. Le recensement omet le nom de la femme et d'un enfant âgé de huit ou neuf mois.

Jean Couillard et sa femme étaient nés en Canada.

Jacques Bernier dit Jean de Paris, de Saint-Germain d'Auxerre, avait épousé, à Québec, 1656, Antoinette Grenier, de Saint-Laurent, diocèse de Paris.

Nicolas Bouchard, de Bernevert, diocèse de la Rochelle, avait épousé, à Saint-Anne, 1670, Anne le Roy, de Saint-Hilaire, diocèse de Sens, en Bourgogne.

François Thibaut s'était marié, à Sainte-Anne, 1670, avec Elisabeth Lefebvre.

Guillaume Ferté, de Saint-Barthélemy, diocèse de Paris, était à l'île d'Orléans dès 1665 ; il se maria en 1682 et continua de résider au même lieu.

Nicolas Durand, né à Québec, se maria en 1685, et resta à Bellechasse.

Joseph Caron, Charles Fortin, François et Guillaume Guion (ou Dion) étaient des enfants du pays.

François Bélanger, de la paroisse de Touques, en Normandie, s'était marié à Québec, 1637, avec Marie Guyon, d'une famille de Mortagne, au Perche.

Philippe Destroismaison, de Notre-Dame de Montreuil, d'Amiens, en Picardie, avait épousé, à Château-Richer, 1669, Martine Crosnier, de Fontenay de Rouen, en Normandie.

René Cloutier, né en Canada, avait épousé Marie Leblanc vers 1675.

Jean-François Bélanger, fils de François ci-dessus ; sa femme, Marie Cloutier, était née dans le pays, comme lui.

Louis Bélanger était frère de Jean-François ; il se maria en 1682.

Olivier Michel dit le Tardif, né en France, avait épousé, à Château-Richer, 1671, Madeleine Cochon, née en Canada. Ses descendants se nomment aujourd'hui Taillon.

Guillaume Lizot, de Saint-Pierre-la-Gravelle, diocèse de Lizieux, avait épousé, à Québec, 1670, Anne Pelletier, née en Canada.

Jacques-Jean Grondin, de Sainte-Marie de Brouage, évêché de Xaintes, en Saintonge, avait épousé, à Québec, 1669, Xaintes Mignot, née en Canada.

René Ouellet, de Saint-Jacques-du-Hautpas, ville de Paris, marié, à Québec, 1666, avec Anne Rivet, avait épousé, en secondes noces, à Québec, 1679, Thérèse Mignot, veuve de Nicolas Lebel. Le ménage Lebel résidait à la côte de Beaupré dès 1665.

Nicolas Huot dit Saint-Laurent, de Saint-Germain d'Auxerre de Paris, avait épousé, à Québec, 1662, Marie Fayette, également de Paris.

Noël Pelletier et sa femme étaient nés en Canada.

Pierre de Saint-Pierre avait épousé, à l'île d'Orléans, 24 avril 1679, Marie Gerbert, née dans le pays.

Jean Pelletier et sa femme étaient natifs du Canada.

Les origines de Rémillard et Thibaut ne nous sont pas connues. Cinquante-quatre colons étaient mariés avant l'année 1673, et neuf seulement le furent de 1673 à 1681 : Rémillard, 1681 ; Marien, 1676 ; Gautron, 1673 ; Sarazin, 1680 ; Posé, 1678 ; Gamache, 1676 ; Gottereau, 1678 ; Saint-Pierre, 1679.

Le recrutement pour les terres de la Durantaye et Bellechasse s'était donc fait à Québec et dans les environs, et non pas en France. Même chose pour la Bouteillerie. Il s'en suit que le seigneur ne déboursait pas un sou.

Or, en voyant que les premiers colons venaient de vingt-cinq ou trente différents points de la France, un esprit malin pourrait en tirer la conclusion que c'étaient des aventuriers. Un autre dirait que M. de la Durantaye faisait venir des familles à son compte. Rien de tout cela n'est soutenable. Les habitants de la rive droite du Saint-Laurent sont tous sortis des groupes établis sur la rive gauche, et vous retrouvez encore leurs familles dans ces lieux, preuve que le déplacement d'une rive à l'autre n'a pas été un fait anormal, mais tout simplement une manière commode d'essaimmer et de s'établir à demeure, selon le terme employé à cette époque. Abandonnons cette croyance sans base qui a fait dire aux écrivains que les seigneurs amenaient avec eux des familles de cultivateurs pour peupler leurs terres. Trop pauvres étaient les seigneurs ; ils se contentaient de concéder des lots qui leur venaient du testament d'Adam. Jamais ils n'ont pu lutter contre leurs censitaires dans le défrichement du sol et l'élevage des bestiaux. C'est à peine s'il s'en est trouvé quelques uns capables de construire un moulin banal. A la fin, après trois générations, les seigneuries appartenaient aux fils des "gros habitants." Les seigneurs, petits fonctionnaires de l'Etat, ne furent pas en mesure de tenir tête aux colons industrieux ; ces derniers prirent leur place, avec le temps, à la tête des seigneuries.

J'accorde néanmoins à M. de la Durantaye une belle part de l'œuvre de la colonisation depuis 1672 à 1681, puisque, avec ses deux seigneuries,

il figure au recensement de 1681 comme le plus avancé, de Lotbinière à l'île aux Oies, ainsi que le montre le tableau suivant :

	Lotbinière.	Villieu.	Lauzon.	Cap Claude.	Beaumont.	La Durantaye.	Bellechasse.	La Bouteillerie.	Ile aux Oies.
Ménages	8	3	44	5	10	12	35	11	5
Habitants non mariés	3	2	6	....	6	4	12	....	1
Tous âges et sexes	58	15	291	27	53	58	227	62	39
Bêtes à cornes	31	1	201	9	9	28	242	104	88
Arpents en valeur	77	28	532	28	58	64	320	134	65
Fusils	11	2	52	2	11	7	62	29	8
Pistolets	....	....	2	....	2	....	....	....	....

Dans toute cette " côte " il n'y avait qu'un seul cheval. Il est vrai que l'on n'en avait pas besoin.

Si, par curiosité, on veut savoir à quelle date ou mois de l'année 1681, fut pris le recensement de la Durantaye et Bellechasse, je dirai que ce dut être à l'automne, mais la chose n'est pas très précise, puisque, sur huit enfants inscrits comme étant âgés de quatre mois, cinq mois, un an, quatorze mois, je trouve que, les dates de naissance comparées, il faut se rendre jusqu'à juin 1682, ou reculer jusqu'à avril 1681 ; mais septembre et octobre 1681 semblent la date réelle.

Celui qui avait créé cette belle seigneurie ne paraît pas avoir fait défricher un seul arpent de terre en son nom, mais il n'était pas resté inactif, on le voit par le nombre et l'importance de ses colons si l'on regarde les seigneuries voisines. Soit que sa femme lui eût procuré les moyens pécuniaires que nécessitait cette entreprise, ou qu'il possédât lui-même quelques ressources en argent, ou encore qu'il sût avec adresse choisir des censitaires en état de se suffir à eux-mêmes, il n'en réussit pas moins à donner de l'élan à sa propriété. C'est pitié de voir combien peu les seigneurs déboursaient pour mettre leurs concessions en valeur. Tous étaient pauvres, vivant des minces appointements de leurs fonctions d'officiers — en un mot, ils étaient ce que l'on nomme de nos jours de simples employés du gouvernement. A ce compte, le plus clair de leur titre de seigneurs était la patente sur parchemin — car dans la réalité, ils se trouvaient les plus petits des habitants. Et la preuve qu'ils ne dépensaient aucun argent sur leurs terres, c'est le taux de quatre à sept sous de redevance par arpent qu'ils prélevaient sur les censitaires. Le colon

prenait tous les risques et gardait les profits. Les fiefs concédés en 1672, sont tous dans le même cas au recensement de 1681 ; lorsqu'on voit vingt colons sur l'un d'eux, c'est le signe d'une grande réussite pour le temps. La Durantaye fit mieux que la plupart des gens de sa classe. Doué d'une nature agissante, il pouvait accomplir davantage sans doute, mais l'argent devait lui faire défaut.

Au recensement de 1681, on le trouve avec sa famille demeurant à Québec :

" Olivier Morel, 37 ans ; Françoise Duquet, sa femme, 35 ans ; enfants : Louis, 10 ans, Geneviève, 9 ans, Philippe, 6 ans, Charles, 5 mois ; 2 fusils et 2 vaches."

Ces quatre enfants avaient été baptisés à Québec, sans compter quatre autres morts au berceau.

Les chiffres du recensement ne sont pas tous exacts, il s'en faut de beaucoup, mais nous n'entreprendrons pas de les contrôler dans le présent travail.

Les événements de l'ouest devaient bientôt enlever M. de la Durantaye à sa famille, pour six ou sept années. Cette partie de sa carrière sera mieux comprise lorsque je publierai mes notes sur Perrot, la Salle, du Luth, Tonty, Baugis, Laforêt, Louvigny et autres hommes qui furent les principaux acteurs des scènes qui se déroulèrent à l'ouest et au sud des grands lacs, de 1678 à 1690.

M. de la Barre, arrivant à Québec pour remplacer le comte de Frontenac, l'automne de 1682, était déterminé à mettre des entraves aux opérations de la Salle et à favoriser quelques trafiquants de pelleteries dont lui, le gouverneur, attendait tirer des avantages, sorte de politique intéressée qu'il avait déjà mise en pratique à Cayenne, lorsqu'il y commandait pour le roi. La Salle fut bien étonné, en 1683, lorsqu'il vit arriver M. de la Durantaye et le chevalier de Baugis avec plein pouvoir de prendre possession de ses forts ou comptoirs de traite, et le priant d'aller trouver le gouverneur à Québec pour expliquer sa situation.

Les canots des associés de M. de la Barre ayant été pillés par des Iroquois descendus en maraude jusqu'au pays des Illinois, et ces sauvages ayant fait le siège du fort Saint-Louis, où commandait Baugis, la guerre fut déclarée, en 1684, contre les deux nations iroquoises les plus rapprochées du sud du lac Erié, mais elle fut si mal conduite que M. de la Barre dut repasser en France, rappelé par ordre du roi. La Durantaye, placé à Michillimakinac, chef-lieu des postes de l'ouest, dirigeait toutes les affaires de ces régions ; il entraîna les sauvages des lacs à la guerre de 1684 contre les Iroquois, mais ne prit part à aucune action, parceque l'armée française ne tint la campagne qu'un instant. La reprise des hostilités en 1687, sous M. de Denonville, fournit à la Durantaye l'occasion de se distinguer, après quoi il retourna à Michillimakinac. Le comte de Frontenac envoya M. de la Porte de Louvigny pour le remplacer, en 1690.

Tout en conservant son poste de capitaine dans les troupes du Canada,

M. de la Durantaye s'appliqua au développement de ses seigneuries et obtint de nouvelles concessions de terre dans cette vue. S'il était de la politique de M. de Frontenac de ne pas laisser à la tête du gouvernement de l'ouest une créature de MM. de la Barre et Denonville, il n'en conserva pas moins le respect dû à un zélé serviteur du prince.

Les courses continuelles des Iroquois dans le Bas-Canada tenaient la petite armée française et les milices sur l'alerte, aussi M. de la Durantaye agissait-il avec sa compagnie, dans les environs de Montréal, où le danger était plus grand que partout ailleurs. La famille résidait dans la seigneurie de la Durantaye ou à Bellechasse, selon ce que je puis voir.

M. de Belmont place dans son *Histoire du Canada* un passage sans date : " La Durantaye tue dix Iroquois à Boucherville." Ceci dut avoir lieu en 1694, car à cette date, M. Gédéon de Catalogne écrit : " Vers les récoltes, on fut averti par les découvreurs qu'il y avait un parti d'ennemis dans la rivière Richelieu, qui descend de Chambly. On fit un détachement de troupes et milice commandé par monsieur de la Durantaye qui, ayant trouvé les canots des ennemis où il n'y avait personne pour les garder, après les avoir laissés en garde à ses canoteurs, qui les mirent en lieu de sûreté, il se mit à marcher sur la piste des ennemis où la route était très mauvaise, ce qui les contraignit de coucher en route. Le lendemain matin ils se mirent en marche. Les découvreurs ayant aperçu l'ennemi, auprès d'un camp, à Boucherville, où l'ennemi encore n'avait osé paraître, furent avertir le commandant, qui marcha en ordre et, quoiqu'il surprît l'ennemi, il le trouva en armes. Les premières décharges furent faites par les Français. Partie de l'ennemi prit la fuite dans les bois. On en tua quelques-uns et fit des prisonniers. Nous y perdîmes deux Canadiens."

Pendant le reste de la belle saison, les Iroquois tentèrent des coups, ça et là, mais avec fort peu de succès. La victoire de la Durantaye eut du retentissement à Michillimakinac, où Lamothe-Cadillac sut la raconter aux sauvages en termes inflammables.

En 1696, la Durantaye commandait un bataillon dans la guerre contre les Iroquois. Il avait alors cinquante-six ans et comptait peu de rivaux, peut-être même aucun supérieur dans l'art de la guerre en Canada. On lit, au tome II, p. 26, de la série de documents historiques publiée par le gouvernement de Québec en 1884, que M. de la Durantaye, ami intime du baron de Saint-Castin, avait su fournir aux autorités de bons renseignements sur les colonies de la Nouvelle-Angleterre.

Mais voici un point tournant dans l'existence de notre personnage. M. de Frontenac étant mort, l'automne de 1698, il se forma un parti pour supporter la candidature de M. de Callières, tandis qu'un autre groupe plaidait en faveur de M. de Vaudreuil. Le récit de Catalogne est assez curieux à lire :

" Dès le petit printemps de 1699, dit-il, M. de Callières envoya des ordres pour que toutes les troupes vinsent camper à Montréal, pour

en faire une revue générale. Les troupes étant en bataille, M. de Callières envoya dire à M. de Vaudreuil de le faire avertir dès que la revue serait faite, qu'il voulait voir défiler les troupes devant lui, et ordonna que les officiers le saluassent de la pique ; l'ordre en fut donné aux troupes. M. de la Durantaye, qui était un des plus anciens capitaines, par son rang, du régiment de Carignan, opina contre, et fit connaître que ce salut n'était dû qu'aux princes ou maréchaux de France. M. de Vaudreuil, par son major, en fit porter la parole à M. de Callières. La chose fut longtemps indécise. Enfin arriva M. de Callières dans sa calèche, d'où il ordonna aux troupes de défiler et de lui faire le salut. M. de Vaudreuil lui dit que c'était contre les ordres du roi, et qu'il ne le ferait que par un ordre par écrit ; en même temps on fit apporter une caisse de tambour, et l'ordre y fut écrit dessus, et le salut se fit. Parmi tous ces mouvements, il y avait de la partialité : M. de Callières avait sa cour et M. de Vaudreuil la sienne. La plupart étaient fort embarrassés, ne sachant sur qui le gouvernement tomberait ; dans cette attente chacun raisonnait. Comme je n'avais point de parti et que j'étais également bien avec tous les deux, je me souviens qu'étant avec M. de Vaudreuil, il me demanda, le même jour que les nouvelles de France arrivèrent,[1] ce que j'en pensais ; je lui dis nettement que je croyais que M. de Callières l'emporterait ; et j'en étais presque sûr parce que M. le chevalier de Crissasy m'avait fait confidence des avis que M. de Callières avait reçus par les Anglais. Cependant M. de Vaudreuil me dit qu'il n'en tâterait que d'une dent. Le même jour, les paquets de la cour arrivèrent, qui confirmèrent ce que je savais. M. de Vaudreuil n'eut pas de plus grand empressement que de venir à ma rencontre, pour me dire de ne point révéler ce qu'il m'avait dit ; je lui ai tenu parole, car voilà la première fois que je l'ai mis à jour. Les partisans de M. de Vaudreuil, quoique par la même promotion il fût nommé gouverneur de Montréal et M. de Ramesay commandant des troupes, se trouvèrent fort embarrassés, entre autres M. de la Durantaye qui, tout d'un coup prit son parti, demanda à passer en France, où il fit démission de sa compagnie, et fut fait conseiller au Conseil de Québec."

Dans ces dernières lignes, les faits sont entassés un peu à la hâte, mais ils paraît bien qu'ils ont eu lieu. M. de la Durantaye ne fut pas nommé immédiatement au Conseil Souverain : il y avait trop de *tirage* entre les puissances de la colonie. Le roi lui accorda, pour patienter, une pension annuelle de 600 francs, somme qui correspond à 400 piastres de nos jours. Voici le texte du brevet concernant cette faveur :

"Aujourd'hui, dix-huitième du mois de mai mil sept cent un, le Roi étant à Versailles, voulant donner au Sr de la Durantaye, ci-devant capitaine d'une compagnie de soldats du détachement de la marine[1] dans

[1] Nommant de Callières gouverneur général.

[2] Troupe soldée par le budget de la marine. C'était de l'infanterie ordinaire et non pas des marins.

la Nouvelle-France, des marques de la satisfaction que Sa Majesté a des services qu'il lui a rendus pendant plus de trente-neuf années, en qualité d'enseigne, de capitaine réformé et de capitaine en pied, tant en France qu'en Canada, où il s'est dignement acquitté des commandements qu'Elle lui a confié, Sa Majesté lui a accordé et fait don de six cents livres de pension annuelle qu'Elle veut lui être payée sa vie durant sur ses simples quittances par les Gardes de son trésor Royal présents et à venir, à commencer de ce jourd'hui, et pour témoignage de sa volonté Sa Majesté m'a commandé de lui expédier le présent brevet qu'Elle a voulu signer de sa main, à être contresigné par moi, conseiller, secrétaire d'Etat et de ses commandements et finances.

" (Signé) LOUIS. PHILIPPEAUX."

M. de Callières étant mort, à la fin de mai 1703, M. de la Durantaye devint conseiller au Conseil de Québec, le 16 juin suivant, et prit son siège au mois de novembre, alors que M. de Vaudreuil était entré en fonction comme gouverneur général. La charge de conseiller rapportait quelques centaines de piastres.

Je pense que la Durantaye habita l'une de ses seigneuries vers la fin de son existence, et qu'il y mourut, pauvre, cela va sans dire, vers 1727, huit années après le décès de sa femme.

Charlevoix observe que cet officier, dont le mérite était reconnu de tous, ne put jamais obtenir en Canada le grade qu'il avait gagné autrefois. Il n'était pas le seul dans ce cas — pour ne citer que la Vérenderie.

II.—*Les Jésuites au Canada.—Le P. de Bonnécamps, dernier professeur d'hydrographie au collège de Québec, avant la conquête.*

(1741-1759)

Par M. L'ABBÉ AUGUSTE GOSSELIN, docteur-ès-lettres.

(Lu le 16 mai 1895)

Le 18 octobre 1700, MM. de Callières et de Champigny écrivaient de Québec au ministre de la marine,[1] à Paris :

" Le sieur Jolliet qui enseignait l'hydrographie à Québec étant mort, et les Pères Jésuites s'offrant d'en tenir une classe,[2] nous supplions Sa Majesté de leur en faciliter les moyens en leur accordant les 400 livres dont le sieur Jolliet jouissait, cette institution étant très utile au pays." [3]

Jolliet avait été nommé professeur d'hydrographie le 30 avril 1697, à la place de Jean-Baptiste-Louis Franquelin, qui enseignait cette science depuis 1686. Franquelin recevait, lui aussi, de la cour 400 livres d'appointements.[4] Avant lui, Martin Boutet, " professeur ez-mathématiques ",[5] occupa longtemps cette chaire officielle d'hydrographie.

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[1] Le comte de Pontchartrain (1699-1715).

[2] Il s'agit d'une classe officielle, subventionnée par l'Etat ; car on enseignait déjà les mathématiques et l'hydrographie au collège de Québec. Nous lisons dans une lettre de Talon au roi, datée de Québec le 3 nov. 1671 : " Le frère donné, jésuite, excellent mathématicien, instruit la jeunesse." On comptait, cette année-là (1671), au collège des jésuites, seize frères donnés, et parmi eux le F. Noël Juchereau, qui avait fait d'assez fortes études en France. Il devint un infirmier célèbre, et fut appelé à soigner des malades, même en dehors de la communauté, surtout parmi les sauvages. Il se noya accidentellement entre l'île d'Orléans et Québec, le 3 nov. 1672.

[3] Archives du ministère des colonies, à Paris.

[4] Ecrivant au ministre, en 1687, il le remercie de l'emploi d'hydrographe qu'il lui a donné. Il représente qu'étant obligé d'avoir un logement qui lui coûte 100 écus par an, pour avoir un grand lieu où il puisse donner ses leçons, et n'ayant que 400 livres d'appointements, il aura peine à subsister ; mais cependant qu'il s'appliquera " de son mieux à l'instruction de ses escoliers ".

[5] " Le 29 janvier 1674, sur ce qui a été représenté au Conseil. . ., que la différence qui se trouve entre les bussoles et instrumens dont les arpenteurs se servent pour aligner et arpenter les habitations, produit diverses contestations entre les propriétaires des terres,... le Conseil ordonne que les arpenteurs mettront dans la quinzaine leurs bussoles et instrumens d'arpentage entre les mains de Martin Boutet, professeur ès-mathématiques, pour être par lui esgallées ; et ce fait, que les dits arpenteurs poseront quatre bornes en la grande place de la basse ville de Québec, scavoir deux bornes sur le rhumb de vent nord-est et sud-ouest, et les deux autres sur celuy du sud et nord-ouest..., pour éviter les changements qui pourraient arriver à l'advenir par la variation de l'aymant.... Ordonne aussi ledit Conseil qu'il ne sera rescu aucun arpenteur à l'advenir qu'il n'ait au préalable fait conformer par ledit Boutet l'instrument dont il se prétendra servir, aux bussoles des autres arpenteurs...." (*Jugements du Conseil Souverain de la Nouvelle-France*, t. I, p. 788.)

On comprend l'importance de la science hydrographique à une époque où il n'était question que de voyages de découvertes et où l'arpentage de tout un continent était à faire. La cour de France avait pourvu à l'enseignement de cette science au Canada : et aucun arpenteur n'était nommé dans la colonie à moins d'avoir un certificat du professeur d'hydrographie.[1]

Martin Boutet[2], Franquelin, Jolliet, voilà les premiers professeurs connus d'hydrographie au Canada.[3] C'est à leur école, sans doute, que s'étaient formés tant de nos jeunes Canadiens qui s'illustrèrent dans des expéditions militaires et des voyages de découvertes. C'est probablement chez Martin Boutet lui-même que Jolliet, l'immortel découvreur du Mississipi, avait puisé les connaissances hydrographiques qui lui permirent de lever la carte des endroits qu'il parcourut en compagnie du P. Marquette[4].

Franquelin et Jolliet ne donnaient pas seulement à leurs élèves la théorie de l'enseignement, ils avaient des œuvres à leur montrer. Dans l'automne de 1685, M. de Denonville transmet au ministre de la marine une "carte du bas du fleuve dessinée par Jolliet."[5] Trois ans plus tard, Franquelin se rend lui-même en France avec une carte qu'il a préparée. "M. Franquelin, notre mathématicien, va à la cour, écrit l'abbé Chabaud ; il emporte une carte considérable que vous pourrez voir chez M. de Seignelay." Et c'est sans doute Jolliet qui, de son côté, prépara la carte du pays que l'intendant Champigny envoya en France le 21 septembre

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[1] *Edits et Ordonnances*, t. II, p. 53.

[2] Martin Boutet était à Québec dès 1648. Sa maison était sur la rue Sainte-Anne, à l'endroit où est maintenant celle de M. le docteur Vallée. C'est probablement là qu'il tenait ses classes d'hydrographie.

Il était originaire de Xaintes. Une de ses filles, née à Xaintes, se fit religieuse aux Ursulines de Québec et devint "la mère Marie Boutet de Saint-Augustin". (*Les Ursulines de Québec*, t. II, p. 53.)

C'était un homme instruit et très estimé. Outre sa profession d'arpenteur, il exerçait aussi les fonctions de "clerc de l'église paroissiale de Québec", ou "clerc de la fabrique" ; et c'est en cette qualité que, le 1er février 1656, il concède une place, ou "un enplacement", dans l'église, à Marie Gauchet, veuve de Jean Dupont, "gouverneur de la ville de Vervins", mère de Nicolas Dupont, qui devint conseiller au Conseil Supérieur en 1670.

Dans un procès-verbal d'arpentage, en date du 17 août 1651, il a pour "porte-chaîne" Marin Boucher, oncle de Pierre Boucher, qui fut gouverneur des Trois-Rivières. Dans un autre arpentage (5 juillet 1655), celui du "fief du cap Diamant", appartenant à la fabrique, il est assisté par son gendre, Charles Philippeau, armurier, François Blondeau et Pierre Chaleut. (Archives paroissiales de N.-D. de Québec.)

[3] Il est probable que Jean Bourdon, "ingénieur de M. le gouverneur" (*Relations des Jésuites*, 1647, p. 36), qui arriva au Canada en 1634, et auquel les jésuites offrirent pour "estraines", le 1er janvier 1646, "une lunette de Galilée où il y avait une boussole" (*Journal des Jésuites*, p. 25), l'auteur d'une des premières cartes connues du Canada, donna, lui aussi, des leçons d'hydrographie à Québec, au moins avant sa nomination comme procureur général du Canada, en 1663.

[4] Le P. Marquette, également, dressa une *Carte de la découverte du Mississipi*. On en conserve l'original au collège Sainte-Marie de Montréal. (*Exhibition of old Mss.*, 1894.)

[5] *Rapport sur les Archives du Canada*, p. xlvi.

1692.[1] Tous ces travaux, encore bien imparfaits, furent utilisés par Belin, lorsqu'il dressa les magnifiques cartes destinées à accompagner le grand ouvrage de Charlevoix sur la Nouvelle-France.[2]

Ce fut Franquelin qui fut nommé de nouveau professeur d'hydrographie pour remplacer Jolliet; mais comme il était en France et ne paraissait pas vouloir revenir en Canada, le gouverneur et l'intendant écrivirent de nouveau en faveur des jésuites,[3] et finirent par leur obtenir la chaire officielle d'hydrographie, qu'ils occupèrent jusqu'à la conquête.[4] En 1744, nous y trouvons installé le P. de Bonnécamps qui fait l'objet de cette étude.

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Le 29 octobre de cette année, l'intendant Hocquart[5] écrivait de Québec au ministre de la marine[6] :

" Le sieur Bonecan, professeur d'hydrographie, m'a représenté qu'il n'avait pu jusques à présent faire aucune observation astronomique, faute d'instruments nécessaires. Il aurait besoin d'une pendule à secondes et d'une lunette montée sur un quart de cercle. Il m'a prié de m'intéresser auprès de vous, monseigneur, pour avoir ces instruments.

" On peut pratiquer au collège de Québec un lieu commode sur le toit pour faire ces observations : il n'en coûtera pas plus de mille à douze

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[1] *Rapport sur les Archives du Canada*, p. lviii.

[2] Belin publia dans les *Mémoires de Trévoux* (oct. et nov. 1743) des " Remarques sur les cartes et plans qu'il a été chargé de dresser pour joindre à l'*Histoire générale de la Nouvelle-France*, par le P. Charlevoix, de la Compagnie de Jésus, et au journal de son voyage dans cette partie du monde."

[3] " Le sieur Franquelin, à qui Sa Majesté a accordé la place de maître d'hydrographie vacante par la mort du sieur Jolliet, ne doit pas venir cette année en ce pays, quoiqu'il en ait reçu les appointements. Comme les Pères Jésuites ont continué cette école à Québec depuis la mort dudit sieur Jolliet, et qu'ils en tenaient même une à Montréal dans l'espérance qu'ils pourraient avoir cette place, nous croyons, monseigneur, qu'il y aurait de la justice qu'ils en reçussent les appointements pendant une année qu'ils ont enseigné...." (Lettre de MM. de Callières et de Champigny au ministre, 5 oct. 1701. Manuscrits relatifs à l'histoire de la Nouvelle-France, à la bibliothèque du Parlement d'Ottawa.)

[4] Voici les noms de quelques-uns des titulaires de cette chaire, d'après les archives du collège Sainte-Marie de Montréal : 1709, P. Chauchetière ; 1712-1719, P. LeBrun ; 1721, P. de Lauzon ; 1723, P. Guignas ; 1727-1732, P. Deslandes. (Notes du R. P. Jones, archiviste, à l'auteur.)

[5] Il arriva à Québec en 1729, et fut d'abord commissaire-ordonnateur, faisant aussi les fonctions d'intendant. Il n'eut le titre d'intendant qu'en 1731, et remplit cette charge jusqu'en 1748. Il demanda, en 1735, un congé d'un an pour passer en France, afin d'y rétablir sa santé. Ayant obtenu ce congé, il alla dans l'automne de 1736 voir son pays natal et revint au Canada en 1737. (*Rapport sur les Archives du Canada.*) En 1755, il commandait l'*Alcide*, l'un des deux vaisseaux français qui furent pris, sur les bancs de Terreneuve, par l'amiral Boscawen. (*Histoire du Canada*, Garneau, t. II, p. 215.)

Il y a dans les *Mémoires de Trévoux* (nov. 1742), une *Notice généalogique sur les familles Hocart et Champflour.*

[6] Le comte de Maurepas.

cents francs ; mais je n'en ferai point la dépense que vous ne l'ayez approuvée.

" Depuis que le P. de Bonecan est au Canada, il s'est beaucoup perfectionné dans les connaissances des mathématiques, et il est dans le dessein de se rendre utile de plus en plus à l'avancement des hautes sciences."

Quatre ans plus tard, le P. de Bonnécamps [1] n'avait pas encore reçu ce qu'il avait demandé, ou du moins tout ce qu'il avait demandé, car le nouvel intendant, François Bigot [2], écrivait à son tour au ministre de la marine [3] :

" Le P. Bonnecan, jésuite, professeur de mathématiques, m'a représenté qu'il avait besoin, pour l'instruction des jeunes gens qui s'adonnent à la navigation, d'une pendule à secondes, d'une lunette d'observation, d'un quart de cercle de trois pieds de rayon garni d'une lunette au lieu de pinnules, et d'une pierre d'ayman, attendu que celle qu'il a est très faible.

" Je vous prie, monseigneur, d'avoir la bonté d'ordonner qu'on nous les envoie conformément à l'état ci-joint [4]."

Il est évident par la lecture de ces lettres, tout à fait inédites [5], que le nouveau professeur d'hydrographie à Québec voulait donner à son enseignement un regain d'intérêt et d'actualité. Il s'occupait tout spécialement des jeunes gens qui s'adonnaient à la navigation et se destinaient à la carrière de la marine ou des armes. Il demandait à grands cris de meilleurs instruments astronomiques que ceux qu'il possédait. Il voulait suivre le mouvement de la science : il voulait établir sur le toit du collège de Québec un observatoire, afin d'y faire, au profit de la science, ces observations astronomiques et météorologiques qui étaient alors si en vogue en France, on peut dire dans le monde entier [6].

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[1] C'est ainsi qu'il signait son nom. Voir plus loin sa signature, telle qu'elle se trouve au bas de sa *Relation de voyage*, aux archives du ministère des colonies.

[2] Il fut d'abord commissaire-ordonnateur à Louisbourg, en 1744. En 1746, il était intendant de l'escadre du duc d'Anville. En 1748, il succéda à M. Hocquart comme intendant du Canada ; " et le roi, dit M. Garneau, étendit sa juridiction sur toute la Nouvelle-France, la Louisiane comprise." (*Histoire du Canada*, t. II, p. 187.)

[3] M. Rouillé.

[4] " Estat des ustensiles de mathématiques demandés par le P. Bonnecan, professeur, savoir :

" Une pendule à secondes ;

" Une lunette d'observation ;

" Un quart de cercle de trois pieds de rayon, garni d'une lunette au lieu de pinnules ;

" Une pierre d'ayman." (Lettre de M. Bigot au ministre de la marine, 9 oct. 1748.)

[5] Elles ont été copiées, pour l'auteur, aux archives du ministère des colonies, à Paris, ainsi que la " *Relation du voyage de la Belle-Rivière fait en 1749 sous les ordres de M. de Céloron*, par le P. de Bonnécamps," et plusieurs autres documents inédits cités dans cette étude.

[6] La Compagnie de Jésus n'avait pas moins de quatre-vingt-douze collèges en France, et à presque tous ces collèges était attaché un observatoire. Les jésuites

Le *Journal des Savants*[1], l'*Histoire de l'Académie royale des Sciences*[2], les *Mémoires de Trévoux* nous font assister à un grand réveil scientifique en Europe, à cette époque, à un magnifique mouvement qui entraîne les esprits vers les plus hautes régions des sciences physiques et naturelles. Le P. de Bonnécamps, "grand mathématicien",[3] veut être un homme de son temps ; il veut que le collège de Québec ne soit pas trop en arrière des grands collèges de la Compagnie de Jésus, que l'enseignement des mathématiques, de l'astronomie, de l'hydrographie y soit solide et pratique, et que les jeunes Canadiens, au sortir de leur cours, puissent faire honneur à leur carrière.

En même temps que ce jésuite distingué travaille ainsi "à se rendre utile de plus en plus à l'avancement des hautes sciences au Canada", un savant jurisconsulte, Louis-Guillaume le Verrier[4], venu ici dès 1728,

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avaient des collèges dans toutes les parties du monde. On sait l'influence que ces religieux exercèrent en Chine au XVIIe siècle et dans la première partie du XVIIIe. Le passage suivant du P. de Rochemonteix nous en donne une idée :

"Les PP. Fontaney, Bouvet et Visdelon firent partie de la célèbre mission scientifique envoyée en Chine par Louis XIV. Bouvet avait fait de brillantes études littéraires au collège de la Flèche. Entré dans la Compagnie en 1674, il s'appliqua spécialement aux sciences physiques et mathématiques, dans le but de se rendre un jour plus utile à la cause de l'Eglise dans le grand empire chinois. Il devint en effet le commensal de Kang-Hi, et son professeur de mathématiques ; il le suivait dans ses promenades, dans ses voyages ; il l'assistait dans ses maladies. L'empereur l'autorisa à construire dans son propre palais une église, où les jésuites érigèrent une congrégation et se livrèrent à toutes les œuvres de bienfaisance et de piété.

"Cependant les missionnaires étaient peu nombreux, et la mort se préparait à faire parmi eux des vides irréparables. Kang-Hi ordonna au P. Bouvet de se rendre en France et d'amener en Chine de nouveaux jésuites ; il le chargea en même temps d'offrir en présent à Louis XIV quarante-neuf volumes chinois, lesquels furent l'origine de la collection chinoise de la bibliothèque Nationale. L'arrivée du P. Bouvet à Paris fut un événement. Versailles et Paris ne parlaient plus que de la Chine; partout où devait se rendre le missionnaire, il était précédé par une foule de curieux qui ne tardaient pas à l'accabler de questions graves ou frivoles....

"De retour en Chine, le P. Bouvet fut nommé géographe impérial. Avec quelques-uns de ses confrères, il dressa aussitôt une description géographique de toutes les provinces de l'empire chinois ; pour complaire à l'empereur, il apprit aussi le tartare, que ce prince préférait au chinois, et bientôt il put s'entretenir avec lui dans cette langue; il devint alors non seulement son professeur, mais encore le confident de ses entreprises, le conseiller de son règne. Cet apôtre, après avoir partagé, pendant près de cinquante ans, tous les labeurs des missionnaires, mourut à Pékin le 28 juin 1732." (*Le Collège Henri IV de la Flèche*, t. IV, p. 281.)

[1] Le premier numéro du *Journal des Savants* parut le 5 janvier 1665.

[2] L'Académie des Sciences fut fondée en 1666.

[3] Journal de Céloron de Blainville.

[4] Ne pas confondre avec François le Verrier, lieutenant de roi à Québec, qui mourut en 1732 : "Nous venons de perdre aujourd'hui, 6 novembre, M. le Verrier, lieutenant de roi de Québec, âgé d'environ 80 ans. Il vint capitaine dans les troupes de ce pays il y a 46 ans, et il avait déjà fait plusieurs campagnes. Il laisse un fils qui est enseigne en pied dans les troupes et qui est un bon sujet." (Lettre de MM. de Beauharnois et Hocquart au ministre de la marine, 6 nov. 1732.)

Voici son acte de sépulture : "Le septième novembre mil sept cent trente-deux a été inhumé dans l'église de cette paroisse le corps de Messire François le Verrier,

fait fleurir à Québec la science du droit. Procureur général au Conseil, il remplit ses fonctions avec une exactitude que le gouverneur et l'intendant ne cessent de louer dans leurs dépêches à la cour.[1]

C'est un homme habile, très appliqué, capable d'éclaircir et de résoudre les questions les plus difficiles. M. Hocquart, faisant allusion, dans une de ses lettres, à une affaire épineuse — celle du frère Turcq[2] — qui venait d'être terminée, rend à M. le Verrier le témoignage "qu'il n'y avait que lui au Canada qui eût pu la débrouiller."[3]

On lui propose de donner à Québec des conférences de droit, et il entreprend ce travail avec un grand zèle : "Je n'ai d'autre ambition, écrit-il, que de consacrer sans réserve tous les moments de ma vie à l'utilité publique[4]". Afin de se rendre de plus en plus utile, il emploie une bonne partie des gratifications qu'il reçoit de la cour à acheter des

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lieutenant de roi de Québec, décédé le jour précédent dans la communion de notre mère la sainte Eglise, après avoir reçu les sacrements de pénitence et extrême-onction, n'ayant pu recevoir le saint viatique, la d. inhumation faite par le chapitre, présence de M. Hocquart, intant de ce pays et MM. Derigo et Dechajons, major (signé) Plante." (Archives paroissiales de N.-D. de Québec.)

Notons cette "inhumation faite par le chapitre". On dirait qu'à la suite des difficultés qui avaient éclaté entre l'archidiacre M. de Lotbinière et les chanoines de Québec, lors des funérailles de Mgr de Saint-Vallier, quatre ans auparavant, le chapitre tenait à affirmer son droit de présider aux sépultures des personnages importants de la paroisse.

[1] Le Conseil d'Etat, par une résolution en date du 25 mars 1730, chargea M. le Verrier de faire "le dépouillement des actes défectueux des notaires de la Prévosté de Québec". (Lettre de MM. de Beauharnois et Hocquart au ministre, 17 oct. 1731.) Ce travail, "d'un examen et d'une étendue immense", fut terminé en peu de temps et à la grande satisfaction de tout le monde.

On le chargea aussi de la confection du papier terrier de la Nouvelle-France. M. Hocquart, écrivant au ministre, le 4 oct. 1740, disait : "M. Verrier m'a remis son septième et dernier volume du papier terrier, à la fin duquel est l'acte de clôture et ensuite trois tables générales alphabétiques tant des seigneuries que des terres en censive contenues dans les sept volumes. Ce terrier peut être regardé comme complet par rapport aux anciennes concessions ; les nouvelles feront un supplément. J'adresse ce septième volume à M. de Ricouart."

[2] Le F. Chrétien Turcq était supérieur de l'hôpital général de Montréal, ayant succédé, vers 1719, à M. Charon qui avait fondé cet hôpital en 1694. "Après avoir fait en France des emprunts considérables, au nom et à l'insu de sa communauté, il passa furtivement à Saint-Domingue, sous prétexte d'y faire des établissements de pêche avec les fonds qu'il s'était procurés, et s'enfuit même dans la partie espagnole de cette île, pour prévenir les poursuites du gouverneur français qui avait reçu ordre de le saisir.... L'hôpital se trouvant chargé des dettes du F. Chrétien, sans pouvoir y satisfaire, les créanciers se saisirent des rentes que les hospitaliers avaient à Paris ; et, ce qui acheva de ruiner l'établissement, le roi, en 1731, supprima la pension de 3,000 livres accordée jusqu'alors pour les maîtres d'école, qui n'avaient en effet rendu aucun service à la colonie." (*Vie de Mme d'Youville*, par M. Faillon.) L'hôpital général fondé par M. Charon passa définitivement sous la conduite de la communauté des sœurs de la Charité fondée par Mme d'Youville, le 3 juin 1753, date des lettres patentes confirmant cette communauté.

[3] Lettre de M. Hocquart au ministre de la marine, 7 oct. 1735.

[4] Lettre de M. le Verrier au ministre, 9 oct. 1733.

livres : sa bibliothèque, qui renferme plus de quatre mille volumes — chiffre énorme pour l'époque[1] — est à la disposition de ses élèves.

Ses conférences, commencées en 1733, n'ont d'abord lieu qu'une fois par semaine ; mais il se voit bientôt obligé de les donner deux fois, le mardi et le samedi. Ses lettres au ministre de la marine nous font connaître quelques-uns de ses élèves : ce sont "les sieurs Varin et Foucault, nouvellement reçus conseillers" (lettre du 9 oct. 1733) ; "le sieur de la Fontaine et le sieur Gaillard... avec le fils du sieur Guillemin, ancien conseiller, jeune homme qui donne beaucoup d'espérance" (19 sept. 1736) ; "les sieurs Berthier, chirurgien du roi, Pouchot, Dufautoir, Moreau, employés au bureau du Domaine, Martel, écrivain au magasin du Roy, le fils du sieur Cugnet, premier conseiller, et le fils du sieur Lanouiller de Boisclerc, grand voyer" (14 oct. 1739) ; "le sieur de Rouville, gendre du sieur André, lieutenant général de la Prévosté, et même, ajoute M. le Verrier, le sieur Gauthier, médecin du Roy : ce dernier excite l'émulation des autres par l'assiduité qu'il donne à mes leçons, autant que les devoirs de sa profession lui en laissent le loisir" (22 oct. 1740).

Hâtons-nous d'ajouter que l'ambition d'obtenir quelque place au Conseil était pour beaucoup dans le zèle de la plupart de ces jeunes gens ou de ces citoyens à suivre les cours de droit de M. le Verrier.[2]

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[1] Plusieurs curés canadiens, sous la domination française, avaient de belles bibliothèques. Celle de M. Philippe Boucher, curé de Saint-Joseph de Lévis (1690-1721), comptait au delà de cinq cents volumes. (*Le curé Philippe Boucher*, par M. J.-E. Roy, dans la *Revue canadienne*, 1891). Philippe Boucher était le digne fils de Pierre Boucher, gouverneur de Trois-Rivières, auteur de l'*Histoire véritable et naturelle des Mœurs et Productions de la Nouvelle-France, vulgairement dite Canada ;* Paris, chez Florentin Lambert, rue Saint-Jacques, à l'image Saint-Paul, in-12, 1670.

[2] Les conférences de droit de M. le Verrier n'étaient pas seulement utiles, elles étaient nécessaires. Avant lui, il y avait souvent des places vacantes au Conseil, faute de personnes qualifiées pour les remplir. "Il y a actuellement deux places de conseillers vaquantes par la mort du sieur Macart arrivée le 8 déc. 1732, et par celle du sieur Hazeur arrivée le 13 mai dernier. Nous n'avons point pour le présent aucun sujet capable de les remplacer." (Lettre de MM. de Beauharnois et Hocquart au ministre, 3 oct. 1733.)

M. le Verrier continua probablement ses leçons de droit jusqu'à sa mort. Il les donnait certainement encore en 1753 : il écrivait à cette date au ministre : "J'ai remis à MM. Duquesne et Bigot une liste apostillée des six sujets venant actuellement à mes conférences. Il vient de s'en présenter un septième ; c'est le sieur Imbert, commis des trésoriers généraux des colonies, en ce pays. Il paraît avoir d'heureuses dispositions, ayant fait de bonnes études, et acquis déjà une teinture des affaires, à l'occasion de cet emploi où il a succédé au feu sieur Taschereau, qui, de son vivant, en était beaucoup soulagé. Le sieur Imbert, qui a de quoi se soutenir honorablement, semble aussi, par son âge et son activité, en état de concilier aisément, avec le service de son emploi, celui de conseiller, quand il vous plaira, monseigneur, l'en gratifier par la suite, sur le rapport de MM. Duquesne et Bigot." (Lettre de M. le Verrier au ministre, 24 oct. 1753.)

M. le Verrier mourut à Québec en 1758. Voici son acte de sépulture : "Le quatorze septembre mil sept cent cinquante-huit, par nous curé de Québec soussigné a été inhumé dans l'église de cette paroisse Mre le Verrier, procureur général du

Le docteur Sarrazin et le chirurgien Berthier étaient morts lorsque le P. de Bonnécamps arriva au Canada.[1] Mais la science médicale y était encore noblement représentée par les docteurs Gauthier et Lacroix et M. Alavoine, "chirurgien des Trois-Rivières".[2] Gauthier jouissait d'une réputation européenne, soit comme médecin, soit comme botaniste.[3] Il était membre correspondant de l'Académie des Sciences.[4] Les communications qu'il adressait de temps en temps au *Journal des Savants* ou aux *Mémoires de Trévoux* faisaient le plus grand honneur à la jeune colonie qui avait l'avantage de posséder un savant aussi distingué. Son étude sur le sucre d'érable fut beaucoup appréciée.

N'oublions pas l'abbé Gosselin, l'un des trois collaborateurs que Mgr Dosquet avait amenés avec lui au Canada.[5] Ce n'était pas seulement un prêtre zélé, dévoué tout entier à son ministère, disposé même à sacrifier sa vie pour ses ouailles, comme il en fit preuve dans l'épidémie de 1740,[6] c'était aussi un botaniste remarquable. A la demande de M. de la Galissonnière, il fit, en compagnie de M. Cugnet, premier conseiller au Conseil Supérieur, une excursion scientifique au Saguenay, d'où il rapporta de précieux trésors pour la science botanique.

Roy au Conseil Supérieur de Québec, âgé d'environ soixante-dix ans. Etaient présents MM. Foucault, Parthuy et autres conseillers au dit Conseil Supérieur et grand nombre de personnes de toute condition. (Signé) J. F. Récher, curé." (Archives paroissiales de N.-D. de Québec.)

[1] Sarrazin mourut à Québec en 1734, et Berthier en 1740.

[2] *Rapport sur les Archives du Canada.*

[3] Le nom de Gauthier a été donné par Linné à un genre important d'arbrisseaux du continent de l'Amérique : *Gaulteria procumbens*, petit thé, thé de montagnes, thé de mérisier.

[4] Le membre de l'Académie avec lequel il correspondait était M. du Hamel. En parcourant les comptes rendus de l'Académie des Sciences de 1744 à 1750, on y trouve plusieurs études de M. du Hamel, intitulées *Observations botanico-météoroligiques faites à Québec par M. Gauthier.* La première commence ainsi :

"J'avais prié M. Gauthier, médecin du Roy à Québec, de faire en ce pays un journal d'Observations botanico-météorologiques. M. Gauthier a satisfait à mon désir au delà de mon espérance. Il m'a adressé par un vaisseau du Roy un journal fait avec beaucoup d'intelligence et de détail, mais trop long pour être présenté en entier à l'Académie....Le journal exact de M. Gauthier commence en novembre 1742 et finit au mois de septembre 1743...."

L'année suivante (1745), M. du Hamel écrivait :

"M. Gauthier, médecin du Roy en Canada, conseiller au Conseil Supérieur de Québec, et correspondant de l'Académie, pour satisfaire au devoir d'un bon correspondant, a envoyé au Jardin du Roy plusieurs plantes avec différents morceaux d'Histoire naturelle, et il m'a adressé un journal botanico-météorologique...." (*Histoire de l'Académie royale des Sciences*, 1744, p. 135 ; 1745, p. 194.)

[5] Les deux autres étaient M. de Latour, l'auteur des *Mémoires sur la vie de M. de Laval*, et M. Boulanger, "bon théologien et fort sage", dit un document de l'époque. L'abbé Gosselin était natif d'Amiens, et fut ordonné prêtre dans la chapelle des Ursulines de Québec en septembre 1734. Il mourut en 1759.

[6] *Rapport sur les Archives du Canada.*

A aucune époque, notre jeune pays n'a manqué de gloire et de grandeur. Mais il nous semble qu'entre toutes les pages de notre histoire, l'une des plus brillantes est celle qui nous montre M. de la Galissonnière présidant aux destinées de notre patrie. On aime à se représenter ce savant si remarquable entouré des hommes éminents que nous venons de nommer, les encourageant dans leurs travaux, les félicitant de leurs découvertes et de leurs succès, recevant à Québec la visite de l'illustre suédois Kalm, et, par la distinction de ses manières aussi bien que par l'étendue et la variété de ses connaissances, lui donnant une haute idée du nom français.[1] On aime surtout à se le représenter visitant de temps à autre le collège des Jésuites, et y encourageant les professeurs et les élèves. Peut-être qu'entre tous les pères celui avec lequel il aimait de préférence à s'entretenir, lorsqu'il se trouvait à Québec,[2] était l'humble et modeste savant qui fait l'objet de cette étude, le mathématicien, le professeur d'hydrographie de l'époque, le P. de Bonnécamps.

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[1] " Le marquis de la Galissonnière est un homme de petite stature, à la taille un peu déformée, et d'un extérieur agréable ; son savoir est vraiment étonnant et s'étend à toutes les branches de la science, surtout à l'histoire naturelle, dans laquelle il est si bien versé, que, quand il commença à discourir sur cette matière, je crus entendre un autre Linné.

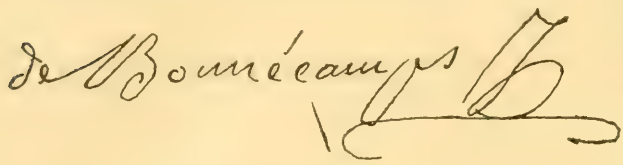
" M'entretenant avec lui de l'utilité de l'histoire naturelle, de la meilleure méthode à suivre pour l'apprendre et l'employer ensuite à améliorer l'état d'un pays, je fus étonné de le voir tirer ses raisons de la politique, aussi bien que de la philosophie, des mathématiques et d'autres sciences. Je confesse que mes conversations avec ce gentilhomme m'ont été très instructives et que j'en ai toujours tiré beaucoup de notions utiles....

" Un plus grand protecteur de la science n'a jamais existé et n'existera peut-être jamais en Canada....Lui arrive-t-il de voir des gens qui ont séjourné dans quelqu'un des établissements les plus éloignés du pays, ou les ont parcourus, il ne manque jamais de les questionner sur les arbres, les plantes, le sol, les pierres, les minéraux de ces localités. Il s'informe également de l'usage que les habitants font de ces choses, de leurs méthodes de culture, des lacs, rivières ou passages de ces pays, et de nombre d'autres détails. Ceux qui paraissent avoir des notions plus claires que les autres, il ne les laisse qu'après en avoir obtenu une description circonstanciée de ce qu'ils ont vu. Il prend note de toutes ces informations, en rédige lui-même des rapports, et grâce à cette grande application si peu commune chez les personnes de son rang, il s'est bientôt acquis une connaissance parfaite des parties les plus éloignées de l'Amérique.

" Les prêtres et les commandants des forts qui se rencontrent chez lui, en visite, à leur retour de contrées quelquefois très distantes les unes des autres, sont surpris des questions qu'il leur pose, et émerveillés de le voir si bien renseigné ; il n'est pas rare qu'il leur dise que près de telle montagne ou tel rivage où ils sont allés souvent faire la chasse, il y a telle plante particulière, des arbres de telle espèce, que le sol est de telle ou telle qualité, qu'on y trouve un certain minéral : or toutes ces informations dont l'exactitude étonne les voyageurs, il les a obtenues d'avance...." (*Voyage de Kalm en Amérique*, traduction de L. W. Marchand, dans les *Mémoires de la Société historique de Montréal*, 1880.)

[2] D'après Kalm, M. de la Galissonnière préférait Montréal à Québec, et y passait généralement l'hiver. (*Ibid.*)

Joseph-Pierre de Bonnécamps naquit à Vannes[1], en Bretagne[2], le 5 septembre 1707. Il entra dans la Compagnie de Jésus, à Paris, le 3 novembre 1727, âgé par conséquent d'un peu plus de vingt ans. Il appartenait à la province de France, appelée aussi province de Paris.



On sait par quel long noviciat doit passer un jésuite avant d'être admis définitivement dans la Compagnie. Ce ne sont pas seulement de laborieux exercices spirituels qu'on lui demande, mais un grand travail de formation littéraire ; et ce n'est qu'après plusieurs années d'études, d'enseignement, d'épreuves de toutes sortes, que le novice, mort à lui-même, et tout entier à sa vocation, est admis à prononcer ses vœux définitifs.

Ce qui est spécialement remarquable, c'est l'attention avec laquelle on observe, chez les jésuites, quelles sont les aptitudes particulières du jeune novice, afin de les cultiver de plus en plus, de les utiliser, et de donner à la carrière de ce novice sa vraie direction.

Le jeune de Bonnécamps enseigna d'abord la grammaire, puis les humanités, puis enfin la rhétorique dans quelque collège de la province de France. Mais on s'aperçut bientôt que ses goûts et ses talents le portaient plutôt vers les mathématiques ; et comme on avait besoin d'un professeur pour enseigner cette science au collège de Québec, on se décida à l'y envoyer.

La mission du Canada dépendait de la province de France.[3] Outre la résidence de Québec, il y en avait une autre à Montréal. Puis il y avait la mission huronne à Détroit et dans les environs, la mission des Iroquois[4], celle des Abénakis[5], celle des Montagnais, celle des Outaouais[6],

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[1] Mgr de Pontbriand, sixième évêque de Québec (1741-1760), était, lui aussi, de Vannes, et presque du même âge que le P. de Bonnécamps. Ils arrivèrent ensemble au Canada. C'étaient probablement des compagnons d'enfance et d'école : ce qui explique le ton familier et badin avec lequel le bon père parle de l'évêque dans une lettre au P. Potier, dont nous avons pris connaissance aux archives du collège Sainte-Marie de Montréal.

[2] La Bretagne nous a fourni trois évêques : Mgr de Mornay, Mgr de Pontbriand et Mgr Briand. Les deux premiers étaient de Vannes ; Mgr Briand, du diocèse de Saint-Brieuc.

[3] Les autres provinces, cependant, l'Aquitaine, la Champagne, la province de Lyon, la province gallo-belge, fournissaient aussi des religieux à la mission du Canada.

[4] A Sault-Saint-Louis.

[5] Saint-Ignace, Saint-François-Xavier, rivière Saint-Jean.

[6] Arbre-Croche, Harbour Springs et Michillimakinac ; les Miamis, rivière Saint-Joseph.

la mission de la Nouvelle-Orléans et celle des Illinois. Plus de cinquante religieux étaient dispersés dans ces différentes résidences et missions.[1]

Il y en avait une vingtaine au collège de Québec, dont douze étaient prêtres, et les autres, frères ou coadjuteurs temporels. Ces jésuites étaient employés soit à l'enseignement, soit au ministère des âmes ; mais ils ne pouvaient suffire à la tâche, comme nous le montre une lettre de MM. de Beauharnois et Hocquart, que nous aimons à citer, parce qu'elle rend un beau témoignage à l'œuvre des jésuites et jette quelque lumière sur leur cours d'études à Québec :

" Monseigneur, le P. de Lauzon, supérieur des missions des PP. jésuites, nous a demandé notre agrément pour passer en France, tant pour solliciter l'envoi de quelques missionnaires, dont ils ont absolument besoin, que pour les intérêts temporels de leur maison et collège de Québec : il s'embarque sur le vaisseau du roi. Ce religieux est également doux et sage, et nous n'avons que lieu de nous louer beaucoup de sa conduite par rapport à la religion et au bien du service du roi auquel il est très attaché.

" Lorsque nous vous avons demandé l'année dernière de procurer un troisième régent au collège de Québec, ça été sur les représentations qui nous en furent faites par les PP. jésuites, qui ont entendu que Sa Majesté en voudrait bien faire la dépense : ils nous ont fait de nouvelles représentations à ce sujet.

" Des trois régents qui sont au collège, il y en a un qui professe alternativement la philosophie et la théologie, en sorte que les jeunes gens, au sortir de leurs humanités, trouvant l'école de théologie ouverte, sont obligés d'attendre pendant deux ans le nouveau cours de philosophie, ce qui les dégoûte à un point qu'ils quittent absolument leurs études, et prennent parti ailleurs.

" Les deux régents de basses classes ne peuvent suffire à multiplier les leçons suivant la faiblesse ou la force de leurs écoliers, qui devraient être séparés en trois ou quatre classes, au lieu qu'ils le sont aujourd'hui en deux classes seulement.

" Nous nous sommes engagés, monseigneur, à vous rendre compte de ces nouvelles représentations, et à vous prier d'obtenir de Sa Majesté le fond de 400 francs pour l'entretien d'un régent de philosophie, à condition que de leur côté les jésuites auront un troisième régent de basses classes, qu'ils entretiendront à leurs dépens, ce qu'ils nous ont promis de faire.

" Ils méritent, monseigneur, par les soins assidus qu'ils donnent à l'éducation de la jeunesse, que Sa Majesté leur accorde cette grâce. Nous croyons devoir vous informer que ces pères, se portant toujours au bien et à l'avantage de cette colonie, entretiennent au collège un frère jésuite[2]

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[1] *Catalogus Personarum et Officiorum Provinciæ Franciæ Societatis Jesu, exeunte anno 1749*, p. 27, *Missiones Americæ Septentrionalis in Novâ Franciâ.*

[2] Ce fut longtemps le F. Pierre le Tellier.

qui enseigne à lire, à écrire et l'arithmétique, aux enfants des habitants de Québec, dont les pères ne sont pas dans le goût de leur faire apprendre la langue latine. Cette école est nombreuse ; ils la tiennent gratuitement, sans qu'il y ait aucune fondation pour cela....." [1]

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Le P. de Bonnécamps arriva à Québec dans l'été de 1741, et se mit de suite à enseigner les sciences mathématiques et hydrographiques pour lesquelles il avait été envoyé au Canada.

C'est le P. de Saint-Pé qui était alors supérieur général de la mission du Canada et recteur du collège.[2] Il fut remplacé vers 1747 par le P. Marcol.

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[1] Lettre de MM. de Beauharnois et Hocquart au ministre de la marine, 6 oct. 1733. Archives de l'archev. de Québec, Doc. de Paris, Eglise du Canada.

L'année suivante, 10 oct. 1734, le gouverneur et l'intendant rendaient aussi un beau témoignage aux prêtres du Séminaire de Québec : "Ils sont fort unis entre eux, et, nous pouvons le dire, fort désintéressés. C'est ce qui les a soutenus jusqu'à présent, et mis en état d'acquitter une partie des anciennes dettes et payer les arrérages de rentes de celles qui subsistent. Nous ne pouvons, monseigneur, que vous dire beaucoup de bien de cette communauté, qui a été de tout temps fort utile à cette colonie, par l'éducation gratuite qu'elle a donnée pendant longtemps aux jeunes gens, et qu'elle serait encore très disposée à donner comme autrefois, si elle se trouvait libérée des dettes considérables qu'elle a été dans la nécessité de contracter à cause des pertes qu'elle a essuyées...." (*Ibid.*)

On fait allusion ici, sans doute, aux incendies de 1701 et 1705, qui obligèrent le Séminaire à réduire le nombre des élèves auxquels il donnait la pension en tout ou en partie. D'après la Potherie, il y avait quatre vingt-six pensionnaires au petit séminaire en 1700 : tous allaient en classe au collège des Jésuites. (*Histoire de l'Amérique septentrionale*, t. I, p. 238.) L'instruction se donnait chez les jésuites ; l'éducation seule au petit séminaire : et il en fut ainsi jusqu'à la conquête.

Voici, d'après une vieille chronique, quel était le cours d'études : "Les annales prouvent qu'il y avait une première et une seconde année de philosophie, une rhétorique et une seconde, une troisième et une quatrième, non pas ensemble, mais alternativement, de deux ans en deux ans. Il y avait aussi une classe de *rudiments* et une *petite école* pour ceux qui ne savaient pas lire. La durée des études variait selon la science et l'aptitude des élèves ; elle était généralement bornée entre cinq et sept ans....En 1696, il y avait cinq philosophes prêts à prendre la soutane." (*L'Abeille*, t. II, nº 13.)

A la date de la lettre citée plus haut (1734), le supérieur du Séminaire était M. Vallier, dont Mgr Dosquet écrit quelque part : "Il a un esprit supérieur, des talents extraordinaires pour les sciences, et surtout celui de se faire aimer de tout le monde. Il a fait sa philosophie à douze ans, enseigné dans son enfance....Il a fait ici les conférences de théologie avec un succès universel." (Archives de l'archevêché de Québec, Doc. de Paris, Eglise du Canada.)

En 1749, lorsque Kalm visita le Séminaire, c'est M. Lalane qui en était le supérieur.

[2] Voir dans l'*Union libérale* du 8 mai 1889 une notice biographique du P. de Saint-Pé. Ce jésuite fit la profession solennelle des quatre vœux dans l'église de Saint-Ignace à Michillimakinac le 2 février 1721, et mourut à Québec le 8 juillet 1770. Le 30 mars 1759, il signa, avec le P. procureur Glapion, la commission nommant le

Dans la visite qu'il fit à Québec en 1749, l'illustre et savant suédois Kalm fut invité à dîner chez les jésuites. Il nous donne une très belle et très intéressante description du collège, tel qu'il était à l'époque où y demeura le P. de Bonnécamps :

"Aujourd'hui (10 août), dit-il, j'ai dîné chez les jésuites[1]. Je leur avais fait une visite, il y a quelques jours, et dès le lendemain leur supérieur et un autre père jésuite vinrent m'inviter à dîner avec eux pour aujourd'hui.

" J'ai assisté au service divin dans leur église, qui fait partie de leur maison[2]. Elle est très belle à l'intérieur, mais dépourvue de sièges, et il

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sieur Mathieu Hianveu, assistant-notaire de N.-D. des Anges, Saint-Gabriel, Sillery et Belair. Cet acte est conservé dans les archives des PP. jésuites, et ce fut probablement le dernier qu'ils firent en qualité de seigneurs sous la domination française. Peu après le P. de Saint-Pé se retira à Montréal pour ne point voir ses communications avec les missions, interrompues par le siège de Québec."

[1] Voici quel était le personnel du collège en 1749 :

R. P. Gabriel Marcol, recteur du collège et supérieur général des missions : de la province de Champagne.

P. Claude-Joseph-Marie Canot, ministre, professeur de théologie, préfet de la congrégation des scholastiques, confesseur à l'église : de la province de Lyon.

P. Antoine Gourdan : de la province de Lyon.

P. Marin-Louis le Franc.

P. Michel Guignas, préfet de l'église, des études, de la congrégation des citoyens et des élèves des classes supérieures, confesseur à l'église : de la province d'Aquitaine.

P. Nicolas de Gonnor, procureur, confesseur à l'église : de la province d'Aquitaine.

P. Pierre de la Chasse, préfet spirituel.

P. Joseph-Pierre de Bonnécamps, professeur d'hydrographie.

P. Siméon le Bançais, novice de première année. (Le P. le Bançais était un prêtre des Missions étrangères qui était venu se consacrer à l'Eglise du Canada. Après un séjour de quelques années au Séminaire de Québec, il se décida à entrer dans la Compagnie de Jésus, où il fut admis comme novice dans l'été de 1749.) (Archives du Séminaire de Québec.)

M. Jean-Baptiste de Neuville.

M. René Macé.

M. Pierre-Régis Billiard.—Ces trois derniers étaient des scholastiques, livrés à l'enseignement, qui n'étaient pas encore prêtres.

COADJUTEURS TEMPORELS OU FRÈRES :

Alexandre Macquet, tailleur.

Antoine Lourse, sacristain et tailleur.

Charles Boispineau, pharmacien.

George Denet, cordonnier.

Jacques Ferchaud, cuisinier.

Jean-Baptiste Delvacq, acheteur.

Nicolas le Clerc, assistant-procureur.

Pierre le Tellier, *docet legere et scribere.*

(Catalogus Provinciæ Franciæ Societatis Jesu, exeunte anno 1749, p. 27.)

[2] Il y avait peut-être un chemin couvert qui reliait l'église à la maison ; mais l'église était une construction à part, comme on le voit par la magnifique gravure qui fut prise sur les lieux par un officier anglais, Richard Short, lors du siège de Québec. Cette église, dont M. de Tracy posa la première pierre en 1666, et pour

faut suivre l'office à genoux. Au-dessus de l'église il y a un petit clocher à cadran.

" La maison qu'habitent les jésuites est magnifique, et a une apparence superbe tant du dehors qu'à l'intérieur : on dirait un vrai palais. C'est un édifice en pierre, à trois étages, outre le grenier, à toit carré très élevé et couvert en ardoise. Il ressemble au nouveau palais de Stockolm, et renferme entre ses murs une cour spacieuse. Ses dimensions sont telles que trois cents familles pourraient y loger à l'aise, et cependant, dans le moment, il n'abrite pas plus de vingt jésuites.[1]

" Mais quelquefois leur maison en contient un bien plus grand nombre, surtout au retour de ceux qui ont été envoyés comme missionnaires dans le pays. A chaque étage il y a un long corridor, sur lequel donnent des chambres, des salles ou d'autres pièces pour les pères, ainsi que la bibliothèque, l'apothicairerie, etc. Tout y est bien ordonné, et les jésuites sont des mieux partagés ici.

" Le collège forme une maison à part ; de grands vergers et des jardins potagers, coupés de belles allées, l'entourent de tous côtés. Outre les arbres de culture, il y a là de nombreux vétérans que la hache du bûcheron a respectés, seuls restes des forêts primitives qui ont vu les commencements de la ville. On y a planté aussi beaucoup d'arbres fruitiers, et le jardin est rempli de toutes sortes d'herbes et de légumes, pour l'usage de la cuisine.

" Les jésuites dînent ensemble dans une grande salle. Adossée à l'un des murs, il y a une tribune, d'où l'un des pères fait la lecture dans quelque ouvrage religieux ; mais ce jour-là, la lecture fut omise ; tout le temps du repas fut employé à la conversation, et à faire honneur au dîner. . . ."

Kalm fait ensuite un juste éloge de ses hôtes :

" Les jésuites, dit-il, sont ordinairement très instruits et adonnés à l'étude, en même temps que très polis et agréables en compagnie. Il y a quelque chose qui plaît dans tout leur maintien, et il n'est pas surprenant qu'ils captivent l'esprit du peuple. Ils parlent rarement de questions religieuses, ou bien, quand il leur arrive d'en parler, ils ont soin d'éviter les disputes.

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laquelle il fit un don de 480 livres, fut démolie en 1807 : elle était très belle. Quel dommage que l'on ait fait disparaître cet édifice sacré, qui était un ornement pour notre ville, et que l'on aurait tant de plaisir à montrer aux étrangers ! *Sunt lacrymæ rerum*. . . .

Outre cette église, les jésuites avaient aussi une chapelle, dont on avait commencé à poser les fondations en 1650. Quelques années plus tard, elle fut jugée insuffisante, et l'on se décida à bâtir une église : mais on y fit les offices jusqu'à ce que celle-ci fût complètement terminée. Il y avait aussi, à part cela, la Congrégation. (*Journal des Jésuites*, pp. 142, 265, 338.)

[1] Ceci était absolument exact, le vingt et unième jésuite, savoir le P. de Bonnécamps, se trouvant absent, lors de la visite de Kalm, pour accompagner l'expédition de Céloron.

" Ils sont toujours prêts à rendre service, et quand ils voient que leur assistance est requise, ils préviennent toute demande d'aide en se mettant tout de suite à l'œuvre, pour faire ce que l'on attend d'eux. Leur conversation est très intéressante et instructive, et l'on ne peut s'ennuyer dans leur société. J'ai causé avec beaucoup de jésuites en Canada, je n'en ai pas trouvé un qui ne possédât ces qualités à un degré éminent....

" On les considère comme des sujets choisis entre beaucoup d'autres à cause de leurs talents supérieurs et de leurs qualités. On les regarde aussi comme gens très habiles, réussissant toujours dans leurs entreprises, et surpassant tous les autres en finesse et pénétration d'esprit. Aussi ai-je remarqué souvent qu'ils ont des ennemis au Canada.

" Ils ne reçoivent dans leur Société que des sujets qui promettent. On ne trouve pas d'imbéciles parmi eux....."

Voici ce que Kalm écrit des habitants de Québec à cette époque :

" Les marchands s'habillent fort élégamment et poussent la somptuosité dans les repas jusqu'à la folie. Les femmes sont tous les jours en grande toilette et parées autant que pour une réception à la cour..... Elles ornent et poudrent leurs cheveux chaque jour, et se papillotent chaque nuit.....Les gentilshommes portent généralement leurs propres cheveux, mais il y en a qui font usage de perruques. Les gens de condition mettent du linge garni de dentelles ; tous les officiers de la couronne ont l'épée. Les gentilshommes, même ceux d'un rang élevé, le gouverneur général excepté, lorsqu'ils vont en ville par un jour qui menace d'être pluvieux, portent leur manteau sur le bras gauche. Les amis de l'un et de l'autre sexe qui ne se sont pas vus depuis quelque temps, se saluent en s'embrassant mutuellement lorsqu'ils viennent à se rencontrer." [1]

Il ne nous a pas paru hors de propos de faire connaître l'institution où le P. de Bonnécamps passa près de vingt années de sa vie, les confrères dont il partagea la douce et tranquille existence, la population avec laquelle il fut si longtemps en rapports pour ainsi dire journaliers, ayant sans doute parmi ses élèves plusieurs de ces fils de famille dont les parents menaient une vie passablement frivole et étalaient un luxe souvent peu en rapport avec leur véritable état de fortune.

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Nul doute qu'en envoyant le P. de Bonnécamps au Canada, ses supérieurs lui recommandèrent de bien profiter de son séjour dans ce pays nouveau, si étendu et encore si peu connu, pour faire beaucoup d'observations scientifiques, et de leur en adresser de fidèles comptes rendus. On avait une revue d'une grande valeur, qui se publiait sous les auspices de la Compagnie : elle s'appelait *Mémoires de Trévoux*, du nom de la petite

[1] Voyage de Kalm en Amérique.

ville,[1] capitale de la principauté de la Dombes, où elle était imprimée. Il fallait alimenter cette revue, de manière qu'elle pût faire bonne contenance à côté du *Journal des Savants:* aussi les professeurs éminents des différents collèges de la Compagnie de Jésus ne manquaient pas de lui envoyer de temps en temps des études et des travaux.

Il est probable que le P. de Bonnécamps adressa plusieurs communications scientifiques soit directement à ses supérieurs de Paris, soit à ses confrères de Trévoux. Malheureusement une seule de ces études est parvenue jusqu'à nous : c'est une "observation météorologique faite à Québec, en Canada, le 12 juin 1746 ". Elle fut publiée dans les *Mémoires* du mois de mars 1747. En voici le texte :

" Vers les neuf heures du soir parut dans le ciel un arc lumineux, large dans son milieu de 7 ou 8 d. et terminé en pointe à ses extrémités. Il représentait un croissant assez bien formé, et sa courbure suivait à peu près la direction des parallèles. Il pouvait embrasser un peu plus du tiers de la sphère. Son milieu ne répondait pas au méridien, et paraissait en être éloigné d'environ 30 d. vers le couchant. Environ les 10 h. la corne orientale s'éclipsa tout à fait, et l'autre s'affaiblit extraordinairement ; mais sur les 11 h. le croissant se forma de nouveau et parut plus brillant qu'auparavant. Son milieu avait changé de situation et répondait au zénith. Ses bords étaient bien détachés et exactement terminés. Le point septentrional de l'horizon paraissait comme un foyer de lumière, d'où sortaient des rayons assez forts pour répandre une espèce de jour sur objets. On ne voyait point de ces colonnes étincelantes, de ces jets de feu, ni de ces guirlandes enflammées, qu'on aperçoit dans les aurores boréales ordinaires. C'était une lumière tranquille, uniforme et semblable à celle d'un beau crépuscule. Elle éclairait toute la surface de l'arc, dont la concavité était d'un blanc assez vif, mais cette blancheur s'obscurcissait un peu vers la convexité.

" Cela dura près d'une heure sans aucun changement notable. Un peu après minuit, le nord devint sombre, les cornes du croissant s'émoussèrent, la vapeur changea de figure et se partagea en plusieurs petits sillons inégaux et presque parallèles au plan du méridien. Quelque temps après, on vit tous ces petits sillons courir dans le même ordre et avec rapidité d'orient en occident : ce qui dura bien un demi-quart d'heure, au bout duquel tout se dissipa."[2]

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[1] Trévoux est aujourd'hui chef-lieu d'arrondissement, dans le département du Rhône, entre Villefranche et Lyon, sur la ligne de Paris à Lyon. Elle était la capitale de la Dombes, petite principauté indépendante que Louis XIV avait créée en faveur du duc de Maine, l'un de ses fils naturels.

[2] *Mémoires de Trévoux*, mars 1747, p. 572.

Les *Mémoires de Trévoux* commencèrent à paraître en 1701. Ils étaient imprimés à Trévoux, mais l'administration se tenait au collège Louis-le-Grand, à Paris. Ils paraissaient tous les mois, et comptent, paraît-il, huit cents volumes, format petit in-12.

Le P. de Sommervogel a publié, en 1864, une excellente *Table méthodique des*

Dans notre mémoire de l'année dernière sur l'abbé Picquet, fondateur de la Présentation, nous avons parlé de l'expédition de Céloron de Blainville à la Belle-Rivière en 1749.[1] M. de la Galissonnière voyant les Anglais commencer à franchir les Alléghanys et envahir peu à peu la vallée de l'Ohio, résolut d'arrêter leur marche et chargea Céloron d'aller reprendre possession du pays au nom de la France. Tout en remplissant cette mission, il devait voir s'il n'était pas possible de créer plusieurs établissements de commerce dans cette vallée.

Céloron organise aussitôt le détachement, dont il est nommé commandant en chef. M. de Contrecœur est le commandant en second. Outre ces deux capitaines, il y a "huit officiers subalternes[2], six cadets, vingt hommes de troupes, cent quatre-vingts Canadiens et environ trente sauvages tant Iroquois qu'Abénakis."

Lachine est le point de départ de l'expédition, et le départ est fixé au 15 juin.

Mais il faut un aumônier pour ce détachement de près de deux cent cinquante hommes. Il faut un guide habile, capable d'éclairer et de diriger la route, capable de dresser une carte des endroits parcourus. Cet homme est tout désigné d'avance : c'est le professeur d'hydrographie du collège de Québec.

M. de la Galissonnière propose au P. de Bonnécamps d'accompagner

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Mémoires de Trévoux, en trois volumes. Le premier volume renferme, outre un *Essai historique sur les Mémoires de Trévoux*, la liste des *Dissertations, pièces originales ou rares, mémoires*, publiés dans la revue. Les deux autres volumes sont consacrés aux articles bibliographiques ; car la bibliographie était de beaucoup la partie la plus importante des *Mémoires de Trévoux*.

Charlevoix fut longtemps attaché à la rédaction des *Mémoires*. Le P. Berthier en fut l'administrateur depuis 1746 jusqu'à la suppression de la Compagnie de Jésus en France en 1762 : "Il restera, dit le P. Sommervogel, comme un des plus beaux types du journaliste".

Sainte-Beuve appelait les *Mémoires de Trévoux* "ce vrai monument de la littérature des jésuites en français".

"Rédigé pendant plus de soixante ans par des membres de la Compagnie de Jésus, dit le P. Sommervogel, ce journal survécut à la catastrophe de 1762, et vingt années encore, quoique sous des titres différents, il conserva une modeste place au milieu des journaux littéraires du dix-huitième siècle, pour s'éteindre enfin vers 1782. . . .

"Le premier numéro avait paru au mois de mars 1701. Il était intitulé : *Mémoires pour l'histoire des sciences et des beaux-arts Recueillis par l'ordre de Son Altesse Sérénissime Monseigneur Prince Souverain de Dombes. Janvier, Février 1701. A Trévoux, De l'Imprimerie de S. A. S. Et se vendent à Paris chez Etienne Ganeau, libraire Rue Saint-Jacques, vis-à-vis la fontaine Saint-Séverin, aux Armes de Dombes. Avec Privilège et Approbation. M.DCCI.*" (Essai historique sur les *Mémoires de Trévoux*.)

[1] *Mémoires de la Société royale du Canada*, 1894, p. 10.

Le *Journal* de Céloron et la *Relation* du P. de Bonnécamps nous font connaître les noms de MM. de Viliers, de Courtemanche, de la Saussaye, de Niverville, de Joannès, le Borgne, Chabert de Joncaire et son frère. Il y avait aussi le fils de Céloron.

l'expédition. Il accepte volontiers, avec l'agrément de son supérieur, et part aussitôt avec sa chapelle et ses instruments astronomiques.

Au jour indiqué, "vers les trois heures après-midi, vingt-trois canots tant français que sauvages" quittèrent Lachine, chargés du personnel et des bagages du détachement. On ne fut de retour à Québec que le 18 novembre, "c'est-à-dire cinq mois et dix-huit jours après en être parti".

Au témoignage de M. de Céloron, le P. de Bonnécamps "donna une extrême attention à la route". Il tint un journal très exact du voyage, puis, au retour, prépara une *Relation* de l'expédition pour M. de la Galissonnière qui venait de passer en Europe. Malheureusement il ne put la lui faire parvenir que l'automne de l'année suivante :

"Il ne me fut pas possible l'année dernière, lui écrit-il, de vous rendre compte de mon voyage dans la Belle-Rivière : tous les vaisseaux étaient partis de Québec quand j'y arrivai. J'aurais pu, il est vrai, vous écrire par la Nouvelle-Angleterre ; mais j'avais à vous dire bien des choses que la prudence ne me permettait pas de faire passer par les mains des Anglais. Ainsi, malgré l'envie extrême que j'avais de répondre à la confiance que vous m'aviez témoignée, j'ai pris le parti de différer à le faire jusqu'au départ de nos vaisseaux."

La relation du voyage du P. de Bonnécamps était accompagnée d'une carte :

"Je vous supplie un petit moment d'audience, écrit-il à M. de la Galissonnière, en faveur de la carte que j'ai l'honneur de vous présenter. Elle est réduite à cause de sa grande étendue ; elle a vingt points fixes qui m'ont été donnés par les hauteurs observées, et que j'ai marqués par des doubles croix.[1]

"La longitude est partout estimée. Si j'avais eu une bonne montre, j'aurais pu en déterminer quelques points par des observations ; mais pouvais-je et devais-je compter sur une montre d'une bonté médiocre et dont j'ai cent fois éprouvé l'irrégularité avant et après mon retour ? Oserais-je dire que mon estime est juste ? En vérité, ce serait être bien téméraire, surtout ayant été obligé de naviguer dans des courants sujets à mille alternatives. Dans l'eau morte même, quelle règle d'estime pourrait-on avoir dont la justesse ne serait pas déconcertée par la variation et les inégalités du vent ou des rameurs ?

"Quant aux rhumbs de vent, je puis répondre que je les ai tous observés et marqués dans mon journal avec le plus grand scrupule, parce que je savais qu'une partie de l'exactitude de ma carte en dépendait. Je n'ai pas non plus manqué de les corriger suivant la variation que j'avais observée. J'ai corrigé pareillement les lieues de distance lorsqu'elles ne s'accordaient pas avec les latitudes observées.

[1] "Malgré les recherches les plus minutieuses, il ne m'a pas été possible de retrouver la carte dont il s'agit." (Lettre de M. Deniel, rédacteur principal au ministère des colonies, à l'auteur, 3 janvier 1895.)

" En un mot, j'ai fait tout mon possible pour répondre aux marques d'estime que vous avez eu la bonté de me donner plus d'une fois. Si je suis assez heureux pour avoir réussi, je vous prie de vouloir bien m'employer quand l'occasion s'en présentera : c'est l'unique récompense que j'attends de mon travail."

Le P. de Bonnécamps rendait ensuite aux officiers de l'expédition un beau témoignage :

" Je ne saurais me résoudre, dit-il, à finir cette lettre sans rendre à MM. les officiers toute la justice qu'ils méritent. Dans les subalternes, j'ai admiré leur zèle pour le service, leur courage quand l'occasion l'a demandé, leur soumission aux ordres du commandant et leur promptitude à les exécuter.

" Pour ce qui est de M. de Céloron, c'est un homme attentif, clairvoyant, actif, ferme, pliant à propos, fécond en ressources et plein de résolution, un homme enfin fait pour commander. Je ne suis pas flatteur, et je ne crains point que ce que je dis me fasse passer pour l'être."

* * *

La *Relation* du P. de Bonnécamps, encore inédite,[1] est très intéressante : c'est l'œuvre d'un savant, d'un observateur ; c'est aussi, sans en avoir la prétention, une œuvre littéraire. Ecrite avec précision et mesure, elle est cependant assez longue : nous n'entreprendrons point de la publier toute entière. Qu'il nous suffise de citer assez des principaux passages pour donner une idée de sa valeur et de son mérite.

Voici d'abord les principales étapes de l'expédition : Pointe-Claire, les Cèdres, Coteau-du-Lac, Anse-aux-bateaux, Mille-Roches, Long-Sault, la Présentation, Catarakoui, Niagara, lac Chautauqua, la Belle-Rivière, la Paille-Coupée, Atigué, Chiningué, Sinhioto, rivière à la Roche, village de la Demoiselle, fort Miamis, lac Erié, Détroit ; puis, au retour : la pointe Pelée, la pointe à la Biche, Niagara, Chouaguen, Catarakoui, la Présentation, etc.

A Coteau-du-Lac, il arrive un accident, le seul de toute la campagne : voici comment le raconte le P. de Bonnécamps :

" Le soir (du 17 juin) nous allâmes camper au Coteau-du-Lac : c'est une langue de terre fort étroite, au bout de laquelle il y a une chute considérable. Le canot de M. de Joncaire eut le malheur d'y tomber et s'y perdit. De quatre hommes qui étaient dedans pour le gouverner, trois eurent le bonheur de se sauver à la nage ; le quatrième ne fut pas si heureux, et périt sous nos yeux, sans pouvoir lui donner le moindre secours. C'est le seul homme que nous ayons perdu dans la campagne."

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[1] M. Parkman, cependant, en cite quelques passages dans *Montcalm and Wolfe*.

Le détachement arrive à Long-Sault le 22, vers les onze heures du matin :

" Là nous fîmes un portage d'un peu plus d'un quart de lieue, et l'on remonta les canots à vide. On ferait beaucoup mieux de les transporter par terre comme on fait le bagage ; on perdrait moins de temps, et on courrait moins de risques : mais la coutume est une loi contre laquelle le bon sens ne prévaut pas toujours." [1]

Voici la description que donne le P. de Bonnécamps du fort Catarakoui :

" Le fort Catarakoui est situé vers le fond d'une anse, environ à une trentaine d'arpents du fleuve. C'est un quarré de pierre de soixante toises : chaque angle est flanqué d'un bastion : vis-à-vis la porte, on a construit une demi-lune. Les environs du fort sont bien découverts et hors de surprise. Il est un peu commandé par un monticule qui n'en est pas fort éloigné. J'observai sa latitude, que je trouvai être de 44° 28′. C'est là proprement que commence le cours du fleuve Saint-Laurent, qui, à mon estime, ne passe pas 230 lieues."

Il admire la limpidité et la fraîcheur des eaux du lac Ontario :

" Les eaux de ce lac, dit-il, sont extrêmement claires et transparentes : à dix-sept et dix-huit pieds, elles laissent apercevoir le fond aussi distinctement que si on le voyait au travers d'un verre poli. Elles ont encore une autre propriété, bien agréable aux voyageurs : c'est de conserver une grande fraîcheur au milieu des étouffantes chaleurs qu'on est quelquefois obligé d'essuyer en passant ce lac."

Il décrit le fort Niagara, dont la situation lui inspire quelques réflexions pratiques :

" Le fort de Niagara est un quarré de pieux revêtus au dehors de pièces de chêne qui lient et fortifient tout l'ouvrage. Un grand corps de logis de pierre forme la courtine qui regarde le lac. Sa grandeur est à peu près la même que celle du fort Frontenac.

" Il est situé sur la rive orientale du canal par lequel se déchargent les eaux du lac Erié. On sera bientôt dans la nécessité de le transporter ailleurs, parce que la côte, minée continuellement par les flots qui viennent s'y briser, s'écroule peu à peu et gagne sensiblement le pied du fort.

" Il serait avantageusement placé au-dessus de la chute, sur un beau platon, où tous les canots sont obligés d'aborder pour faire le portage. Par là on épargnerait aux sauvages, nation naturellement paresseuse, la peine de faire trois lieues par terre ; et pourvu qu'on diminuât le prix excessif des marchandises, on les dégoûterait insensiblement des Anglais, et on verrait refleurir la traite, qui est presque entièrement tombée.....

" La fameuse chute de Niagara, ajoute-t-il, est à très peu près à égale

[1] Dans son *Journal*, Céloron dit que "plusieurs canots furent crevés dans les rapides". Et ailleurs : "Plusieurs canots furent cassés par la mauvaise volonté de ceux qui les conduisaient : je les fis raccommoder et continuai ma route".

distance des deux lacs. Elle est formée par un rocher coupé à plomb et haut de 133 pieds, suivant ma mesure, que je crois exacte.[1] Sa figure est une demie ellipse, divisée vers son milieu par une petite île. La largeur de la chute peut être d'un quart de lieue et demi. L'eau tombe en écume le long du rocher, et est reçue dans un vaste bassin, au-dessus duquel règne un brouillard perpétuel."

Le lac Erié ne lui sourit pas autant que le lac Ontario :

" Nous avons suivi la côte : elle est assez régulièrement droite, médiocrement élevée, et fournit peu d'abris ; en bien des endroits, ce n'est que roc couvert de quelques pouces de terre. Le lac Erié n'est pas profond ; ses eaux n'ont ni la transparence ni la fraîcheur de celles du lac Ontario." [2]

Puis il ajoute : " C'est dans ce lac que j'ai vu pour la première fois des dindes sauvages : ils ne diffèrent en rien de nos dindes domestiques."

Du lac Erié [3] au lac Chautauqua, où l'on arriva le 22 juillet, il y a un portage d'environ trois lieues et demie :

" Le chemin est passablement beau.[4] Le bois au travers duquel il est frayé ressemble à nos forêts de France. Le hêtre, le frêne, l'orme, le chêne rouge et blanc, voilà ce qui en compose la plus grande partie. On y trouve une espèce d'arbre qui n'a point d'autre nom que celui de bois inconnu : sa tige est haute, droite, et presque sans branches jusqu'à sa cîme : c'est un bois mou et léger : on s'en sert pour faire des pirogues, et il n'est bon qu'à cela [5]."

On traversa le lac Chautauqua, puis l'on s'avança bien péniblement dans la petite rivière qui lui sert de décharge :

" L'eau manqua tout à coup sous nos canots, dit le P. de Bonnécamps, et nous fûmes réduits à la triste nécessité de les traîner sur des cailloux, dont le tranchant, malgré nos soins et nos précautions, en enlevait de temps en temps de larges aiguillettes. [6]

" Enfin, accablés d'ennui, et désespérant presque de voir la Belle-

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[1] La hauteur, aujourd'hui, est de 160 pieds. La différence s'explique par le recul de la chute, causé par l'érosion.

[2] " Le lac est extrêmement plat ; il n'a pas d'abri. A plus de vingt lieues dans le large, on trouve des pierres extrêmement grosses, sur lesquelles on est en danger de périr. Je tombai sur une, et, sans un prompt secours, j'étais noyé avec tout mon monde. Je mis à terre pour raccommoder mon canot, qui avait été crevé en plusieurs endroits." (Journal de Céloron.)

[3] On partit de l'endroit où est aujourd'hui la petite ville de Portland.

[4] Céloron avait soin d'envoyer en avant une partie du détachement pour préparer la voie au corps d'expédition : " Sitôt que tous mes canots furent chargés, je détachai M. de Viliers et le Borgne avec cinquante hommes pour aller nettoyer les chemins." (Journal de Céloron.)

[5] Serait-ce par hasard le *thuya*, vulgairement le cèdre, mais qui n'est pas du tout le cèdre de l'Europe ?

[6] " A bien des endroits, j'étais obligé de mettre quarante hommes sur chaque canot pour le faire passer." (Journal de Céloron.)

Rivière, nous y entrâmes le 29 (juin) à midi.[1] M. de Céloron fit enterrer une lame de plomb sur le bord méridional de l'Ohio, et plus bas il fit attacher à un arbre les armes du roi.[2] Après cette opération, nous allâmes camper vis-à-vis un petit village d'Iroquois de douze ou treize cabanes : on le nomme Kananouangon[3].

"Le 30, nous nous rendîmes à la Paille Coupée.... C'est un village très médiocre, composé d'Iroquois et de quelques Loups. Il est situé sur la rive septentrionale de l'Ohio, et borné au nord par un groupe de montagnes qui forment un petit bassin fort étroit au fond duquel est le village. Sa latitude est de 42° 5′."

Le corps d'expédition suit désormais le cours de la Belle-Rivière. Le P. de Bonnécamps décrit la route, et note les principaux incidents du voyage :

"Le 1er août, nous marchâmes toute la journée entre deux chaînes de montagnes qui bordent la rivière à droite et à gauche. L'Ohio est fort plat pendant les vingt premières lieues ; mais un gros orage que nous avions essuyé la veille de notre départ avait fait enfler les eaux, et nous passâmes partout sans aucun embarras.

"M. Chabert prit ce jour-là sept serpents à sonnettes : ce sont les premiers que j'ai vus. Ce serpent n'a rien qui le différencie des autres, sinon que sa queue est terminée par sept ou huit petites écailles enchâssées les unes dans les autres et qui font une espèce de cliquetis quand l'animal

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[1] La partie de l'Ohio qu'ils atteignirent alors s'appelle aujourd'hui l'Alléghany. Cette rivière se joint plus loin, vers Pittsburg, à la Monongahéla, et devient alors l'Ohio proprement dit.

[2] Copie du procès-verbal de la position de la plaque de plomb et des armes du Roy posées à l'entrée de la Belle-Rivière, avec l'inscription :

"L'an mil sept cent quarante-neuf, nous Céloron, chevalier de l'ordre royal et militaire de Saint-Louis, capitaine commandant un détachement envoyé par les ordres de M. le marquis de la Galissonnière, commandant général du Canada, dans la Belle-Rivière autrement dite l'Ohio, accompagné des principaux officiers de notre détachement, avons enterré au pied d'un chêne rouge sur la rive méridionale de la rivière Ohio et de Kananouangon, et par quarante-deux degrés cinq minutes vingt-trois secondes, une plaque de plomb, avec l'inscription ci-dessous gravée :

"L'an 1749, du règne de Louis XV, roi de France, Nous Céloron, commandant du détachement envoyé par M. le marquis de la Galissonnière, commandant général de la Nouvelle-France, pour rétablir la tranquillité dans quelques villages de ces cantons, avons enterré cette plaque au confluent de l'Ohio et de Kananouangon, le 29 juillet, pour monument du renouvellement de possession que nous avons prise de la dite rivière Ohio et de toutes celles qui y tombent, et de toutes les terres des deux côtés jusqu'à la source des dites rivières, ainsi qu'en ont joui ou dû jouir les précédents rois de France, et qu'ils s'y sont maintenus par les armes et par les traités, et spécialement par ceux de Ryswick, d'Utrecht et d'Aix-la-Chapelle. Avons de plus affiché dans le même lieu à un arbre les armes du Roy. En foi de quoi avons dressé et signé le présent procès-verbal, fait à l'entrée de la Belle-Rivière le 29 juillet 1749. Tous les officiers ont signé." (Journal de Céloron.)

D'après M. Parkman, un notaire accompagnait l'expédition. (*Montcalm and Wolfe*, t. I, p. 43.)

[3] Aujourd'hui Conewango.

marche ou s'agite. Les uns ont des taches jaunâtres répandues sur un fond brun, les autres sont entièrement bruns et presque noirs. Il y en a, m'a-t-on dit, de fort grands : aucun de ceux que j'ai vus ne passait quatre pieds.[1]

" La morsure est mortelle. On prétend que laver la plaie qu'il a faite, avec de la salive, mêlée d'un peu de sel marin, est un remède souverain. Nous n'avons pas eu, Dieu merci, l'occasion de faire l'épreuve de cet antidote.

" On m'a raconté mille choses merveilleuses de ce reptile ; entre autres, que l'écureuil apercevant un serpent à sonnettes entrait aussitôt dans de violentes agitations, et qu'au bout d'un certain temps, entraîné pour ainsi dire par un charme invincible, il venait de lui-même se jeter dans la gueule du serpent. J'ai lu un fait tout semblable rapporté dans les Transactions philosophiques ; mais je ne me rends pas encore pour cela."

Le P. de Bonnécamps continue à décrire le chemin parcouru, et enregistre tout ce qui peut intéresser M. de la Galissonnière :

" Nous poursuivîmes notre route, et nous marchâmes comme le premier jour, ensevelis dans cette sombre vallée qui sert de lit à l'Ohio. . . .

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[1] Le serpent à sonnettes est particulier à l'Amérique : voilà sans doute pourquoi le P. de Bonnécamps en fait la description à M. de la Galissonnière.

Du reste, il y avait longtemps qu'un autre père de la Compagnie de Jésus avait décrit le serpent à sonnettes. Voici en effet ce qu'on lit dans la *Relation* de 1657, où il est question d'un essai d'établissement français sur les rives du lac Gannentaha, au centre de la confédération iroquoise :

" Il se rencontre au même endroit certains serpents qui ne se voient pas ailleurs et que nous appelons des serpents à sonnettes, parce qu'en rampant ils font un bruit semblable à celui d'une sonnette, ou plutôt d'une cigale. Ils portent au bout de leur queüe certaines écailles rondes engagées l'une dans l'autre, de telle sorte qu'en les ouvrant et resserrant, ils font ce bruit qu'on entend de vingt pas. Ces sonnettes ou écailles ne laissent pas de faire du bruit quand on les remue après la mort du serpent ; mais il n'est pas si grand que celui qu'elles font lorsque le serpent est en vie.

" Les originaires du pays d sent que ces écailles sont excellentes contre le mal de dents, et que sa chair, qu'ils trouvent d'aussi bon goût que celle de l'anguille, guérit de la fièvre : ils en coupent la queüe et la tête, qui est toute plate et presque carrée, et mangent le reste.

" Son corps a environ trois pieds de longueur ; il est plus gros que le poignet d'un homme, et tout marqueté sur le dos de taches noires et jaunes, excepté sur la queüe, qui est quasi toute noire. Il a quatre dents, deux en haut et deux en bas, aussi longues mais plus aigües que nos petites aiguilles. Il mord comme un chien, et fait découler son venin dans la morsure par un petit aiguillon noir qu'il tire d'une bourse où ce poison est renfermé. Quand quelqu'un en est mordu, il enfle aussitôt, et s'il n'est promptement secouru, il meurt en peu de temps, tout couvert de pustules rouges.

" Aussitôt que ces serpents voient un homme, ils siflent et battent de la queüe, faisant jouer leurs sonnettes, soit pour épouvanter leur ennemi, soit pour s'animer au combat, ou plutôt parce que Dieu leur a donné cet instinct, afin que les hommes soient sur leurs gardes à l'approche d'un si dangereux animal. . . ." (*Relations des Jésuites*, 1657, p. 13.)

Le soir, après notre débarquement, on enterra une 2e lame de plomb sous un gros rocher sur lequel on voit plusieurs figures grossièrement gravées. Ce sont des figures d'hommes et de femmes, des pistes de chevreuils, de dindes, d'ours, etc., tracées sur le roc. Nos messieurs voulaient me persuader que c'était un ouvrage d'européens ; mais en vérité je puis dire que les gravures sont d'un goût et d'un travail à ne pas méconnaître la maladresse des Sauvages. Je pourrais ajouter à cela qu'elles ont bien du rapport avec les hiéroglyphes dont ils se servent au lieu d'écriture.

"Le 4 (août) nous continuâmes notre route, toujours environnés de montagnes quelquefois si hautes qu'elles ne nous permettaient pas de voir le soleil avant neuf ou dix heures du matin ou après deux ou trois heures du soir. Cette double chaîne de montagnes règne le long de la Belle-Rivière, du moins jusqu'à la rivière à la Roche. Elles s'éloignent de temps en temps du rivage, et laissent voir de petites plaines d'une ou deux lieues de profondeur.

"Le 6 nous arrivâmes à Attigué,[1] où nous ne trouvâmes personne : tout le monde s'était enfui dans les bois. Voyant cela, nous passâmes outre et nous vînmes à l'ancien village des Chaouanons, où nous ne trouvâmes qu'un vieillard et une vieille qui tous les deux ensemble faisaient bien deux siècles.[2]

"Quelque temps après, nous rencontrâmes cinq Anglais qui nous parurent être des engagés. On les somma de se retirer, et ils répondirent qu'ils étaient prêts à obéir. On leur remit une lettre pour le gouverneur de Philadelphie : c'était une copie de celle que vous aviez donnée pour modèle.[3]

"Ces Anglais venaient de Chiningué et de Sinhioto. Ils avaient une quarantaine de paquets de pelleteries qu'ils se préparaient à transporter à Philadelphie. Ces paquets consistaient en peaux d'ours, de loutres, de

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[1] Aujourd'hui Kittanning.

[2] "Je rembarquai, et je passai le même jour à l'ancien village des Chaouanons, qui est abandonné depuis le départ du nommé Chartier et sa bande, qui fut levé de cet endroit par les ordres de M. le marquis de Beauharnais, et conduit à la rivière au Vermillon, dans Ouabache, en 1745." (Journal de Céloron.)

[3] "Monsieur, ayant été envoyé avec un détachement dans ces quartiers par les ordres de M. le marquis de la Galissonnière, commandant général dans la Nouvelle-France, pour réconcilier avec elle quelques nations sauvages qui s'étaient brouillées, à l'occasion de la guerre qui vient de finir, j'ai été très surpris de trouver des négociants de votre gouvernement dans ce pays, sur lequel l'Angleterre n'a jamais eu aucune prétention. Je les ai traités avec toute la douceur possible, quoique je fusse en droit de les regarder comme des interlopes et des gens sans aveu. Leurs entreprises étaient contraires aux préliminaires de la paix signées depuis plus de quinze mois. J'espère, monsieur, que vous voudrez bien à l'avenir défendre ce commerce qui est contre les traités, et faire avertir vos négociants qu'ils s'exposent beaucoup s'ils reviennent dans ces contrées, et qu'ils ne doivent imputer qu'à eux les malheurs qui pourraient leur arriver. Je sais que notre commandant général serait très fâché d'en venir à quelques violences. Mais il a des ordres très précis de ne point laisser de négociants étrangers dans son gouvernement." *(Ibid.)*

chats de pécans et de chevreuils en poil ; car on ne voit là ni martes ni castors.

" Les Anglais nous dirent qu'ils comptaient cent lieues de là à Philadelphie."

La botanique occupe une grande place dans la relation du P. de Bonnécamps :

" Un de nos officiers me montra un févier[1] : c'était un arbre de moyenne grandeur, dont le tronc et les branches sont armés de pointes longues de trois ou quatre pouces, et grosses vers leur base de deux ou trois lignes. L'intérieur de ces pointes est rempli de moelle. Le fruit est une espèce de petites fèves renfermées dans une gousse longue d'environ un pied, large d'un pouce, et de couleur roussâtre mélangée d'un peu de vert. Il y a cinq ou six fèves dans chaque gousse.

" Le même jour (7 août) nous dinâmes sous un cotonnier creux, dans lequel on rangea vingt-neuf hommes les uns à côté des autres. Cet arbre n'est pas rare dans tous ces cantons-là. Il croît sur le bord de l'eau et dans des endroits marécageux. Il se lève fort haut et porte beaucoup de branches. Son écorce est mince, et rude comme du chagrin. Le bois en est dur, cassant, et sujet à la pourriture. Je ne crois pas en avoir vu deux qui ne fussent creux. Ses feuilles sont larges et épaisses ; son fruit est de la grosseur d'une petite noisette enveloppée dans du duvet : le tout ressemble à une pomme assez exactement sphérique et d'environ un pouce de diamètre.

" Puisque je suis sur l'article des arbres, il faut vous dire quelque chose de l'assiminier et de celui qu'on pourrait appeler le lentillier. Le premier est un arbrisseau dont le fruit a la figure d'une ovale et est un peu plus gros qu'un œuf d'outarde. Sa substance est blanche et spongieuse ; elle devient jaune quand le fruit est mûr ; elle contient deux ou trois pépins larges et plats comme les fèves de marais : ils ont chacun leur cellule particulière. Les fruits viennent ordinairement deux à deux et sont suspendus au même pied. Les Français lui ont donné un nom qui n'est pas fort honnête : *Testiculi asini*. C'est un mets délicat pour les Sauvages et les Canadiens : pour moi, je l'ai trouvé d'une fadeur insupportable.

" Celui que j'appelle le lentillier est un arbre d'une grandeur ordinaire. La feuille est courte, oblongue, et dentelée tout autour. Son fruit approche fort de nos lentilles : il est renfermé dans des gousses qui viennent par grosses touffes à l'extrémité des branches."

A Chiningué[2], nos voyageurs ne furent pas accueillis d'une manière très engageante :

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[1] Robinia pseudo-acacia.

[2] Chiningué était environ à 17 milles en aval de l'endroit où s'étend aujourd'hui la florissante ville de Pittsburg.

" Ce village, dit Céloron, est composé d'Iroquois, de Chaouanons et de Loups....

"Il était trois heures quand nous y arrivâmes. Nous débarquâmes au pied d'une côte fort élevée : elle était bordée de monde, et l'on nous salua d'une quadruple décharge à balles : nous répondîmes sur le même ton. M. de Céloron faisant réflexion sur la mauvaise situation de son camp, si nous restions au bas de la côte, prit le parti de le faire transporter en haut et de nous placer entre le village et le bois. La chose fut exécutée à la vue des sauvages, qui n'osèrent s'y opposer.

"Quand nous fûmes bien établis, les chefs vinrent saluer le commandant. Après des compliments réciproques, M. de Céloron leur témoigna son mécontentement de ce qu'ils avaient arboré le pavillon anglais vis-à-vis celui de France, et leur commanda de l'ôter. Le ton ferme dont il le dit, fit qu'on lui obéit.

"Le soir, on doubla la garde, et au lieu de quarante hommes qui la montaient régulièrement toutes les nuits depuis notre entrée dans Chautauqua, on en mit quatre-vingts : de plus, il fut ordonné à tous les officiers et aux engagés de se coucher tout habillés.

"Le 9 (août) au matin, un sauvage vint dire à M. de Joncaire que quatre-vingts guerriers partis de Kaskaské étaient sur le point d'arriver, qu'ils venaient dans le dessein de secourir leurs frères et de frapper sur nous. M. de Joncaire en ayant fait son rapport au commandant, celui-ci donna sur le champ ses ordres pour se bien préparer à recevoir l'ennemi. Ces préparatifs n'eurent pas lieu. Les sauvages voyant notre bonne contenance et notre supériorité en nombre, filèrent doux, et nous saluèrent fort poliment en passant devant notre camp. Le reste de la journée, tout fut tranquille."

Sur la route de Chiningué à Sinhioto[1], on rencontra quelques bœufs illinois :

"Mais ils étaient en si petite quantité, dit le P. de Bonnécamps, qu'à peine a-t-on pu en tirer une vingtaine ; encore fallait-il aller les chercher bien avant dans le bois. On nous avait cependant assuré en partant qu'à chaque pointe nous les trouverions par centaines, et que les langues seules de ceux que nous devions tuer suffiraient pour nourrir le détachement.[2] Ce n'est pas la première fois que j'ai éprouvé, ajoute-t-il,

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Outre ces trois nations, il y a dans ce village des Iroquois du sault Saint-Louis et du lac des Deux-Montagnes, des Nipissings, des Abénakis, Outaouais et autres nations. Cet assemblage forme un très mauvais village, qui séduit par l'appât du bon marché que leur fait l'Anglais, et les entretient dans de très mauvaises dispositions pour nous."

[1] Aujourd'hui Scioto, à l'embouchure de la rivière Scioto.

[2] "Ayant bien des malades, je fis chasser mes sauvages, dans l'espérance que cette Belle-Rivière, qu'on avait annoncée à M. le gouverneur pour être abondante en bœufs, m'en fournirait pour rafraîchir mon monde, qui ne vivait plus qu'à la colle ; mais je fus trompé : mes sauvages n'avaient tué que quelques chevreuils : c'est une faible ressource pour soulager du monde affamé et malade." (Journal de Céloron.)

que l'hyperbole et l'exagération étaient des figures familières aux Canadiens."

Même réception à Sinhioto qu'à Chiningué :

" Quand nous fûmes proche de Sinhioto, M. de Céloron, par l'avis des officiers et des sauvages, députa MM. de Joncaire et de Niverville pour annoncer notre prochaine arrivée aux Chaouanons. Leur réception ne fut pas gracieuse. Sitôt qu'on les aperçut, on fit feu sur eux, et leur pavillon fut percé en trois endroits. Malgré cette grêle de mousquetade, ils s'avancèrent jusqu'au rivage, et débarquèrent sans avoir reçu aucune blessure.

" On les conduisit à la cabane du Conseil. A peine M. de Joncaire eut-il commencé sa harangue, qu'un misérable panis, aposté selon toute les apparences par les Anglais, se leva brusquement, criant qu'on les trompait, et que les Français ne venaient chez eux que pour les détruire. Ce cri fut comme un cri de guerre : on courut aux armes, on arrêta nos envoyés, on parla de les attacher au poteau, et peut-être en fût-on venu à l'exécution, si un Iroquois qui se trouva là par hasard n'eût apaisé les furieux en les assurant que nous n'avions aucun mauvais dessein. . . ."

Le détachement arriva sain et sauf à Sinhioto. On tint conseil avec les Chaouanons qui l'habitaient, et le résultat des délibérations fut plus satisfaisant qu'on ne l'avait espéré tout d'abord.[1]

" Le soir du 25 août, dit le P. de Bonnécamps, on fit un feu de joie pour célébrer la Saint-Louis. Tout le détachement était sous les armes, et l'on fit une triple décharge de mousqueterie, précédée de plusieurs : Vive le Roi ! "

Il y a quelque chose de touchant dans cette démonstration d'une poignée de Français, au milieu des forêts du nouveau monde, à plusieurs mille lieues de leur patrie, tenant à exprimer solennellement leur attachement à leur roi.

Voici ce que le P. de Bonnécamps dit de Sinhioto :

" La situation du village des Chaouanons est assez agréable : du moins il n'est point masqué par les montagnes comme les autres par où nous avons passé. La rivière de Sinhioto qui le borne à l'ouest lui a donné son nom. Il est composé d'une soixantaine de cabanes. Les Anglais y étaient au nombre de cinq : on leur dit de se retirer, et ils promirent de le faire. La latitude de notre camp était de 39° 1′."

C'est à peu près le point le plus méridional qu'on atteignit dans ce voyage. On continua à suivre le cours de l'Ohio jusqu'à la rivière à la

[1] " A un quart de lieue du village, je fus découvert. Aussitôt les saluts commencèrent, et ces sauvages tirèrent bien mille coups de fusil. J'ai su que la poudre leur était fournie gratis par les Anglais.

" Je débarquai vis-à-vis le village et fis rendre le salut. Les chefs et les anciens traversèrent la rivière et vinrent à moi avec des pavillons et des calumets de paix, firent couper de l'herbe pour nous faire des sièges, et m'invitèrent à prendre séance avec tous mes officiers. . . ." (*Ibid.*)

Roche[1], " où nous entrâmes, dit le P. de Bonnécamps, le 31 août vers les quatre heures du soir, après avoir enterré la sixième et dernière lame de plomb ".

" La Belle-Rivière, si peu connue des Français, ajoute-t-il, et par malheur trop connue des Anglais, a, suivant mon estime, cent quatre vingt-une lieues marines depuis la sortie de Chautauqua jusqu'à l'entrée de la rivière à la Roche. Dans tout cet espace, nous avons compté douze villages établis sur ses bords ; mais si l'on pénètre dans ce petit continent[2] renfermé entre le lac Erié et l'Ohio, on le trouvera, à ce que l'on nous a dit, beaucoup plus peuplé. On nous a parlé surtout d'un certain village situé sur la rivière de Kaskaské, dans lequel on nous a assuré qu'il y avait plus de huit cents hommes. Chaque village, soit grand, soit petit, a un ou plusieurs traiteurs, qui ont sous eux des engagés pour le transport des pelleteries.

" Voilà donc les Anglais déjà bien avancés sur notre territoire, et qui pis est, ils y sont sous la protection d'une foule de sauvages qu'ils ont attirés à eux et dont le nombre grossit tous les jours. Leur dessein n'est pas sans doute d'en demeurer là ; et si l'on ne prend pas au plus tôt des mesures efficaces pour arrêter leurs progrès, nous courons grand risque de nous voir bientôt chassés des pays d'en haut et d'être obligés de nous renfermer dans les bornes qu'il plaira à ces messieurs de nous prescrire. Ceci est peut-être plus vrai qu'il ne paraît vraisemblable."

Le détachement, quittant définitivement la Belle-Rivière remonta la rivière à la Roche, jusqu'au village de la Demoiselle[3] :

" Le 13 septembre, nous eûmes l'honneur de saluer la Demoiselle[4] dans son fort.[5] Il est situé dans une vaste prairie sur le bord de la rivière à la Roche. Sa latitude est de 40° 34′. Cette bande n'est pas nombreuse : elle a à tout le plus de quarante à cinquante hommes."

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[1] La grande rivière Miami. On avait dépassé l'endroit où s'étend aujourd'hui la ville de Cincinnati.

[2] C'est aujourd'hui l'Etat de l'Ohio, avec une lisière de la Pennsylvanie et même une pointe de l'Etat de New-York. Le lac Chautauqua est dans l'Etat de New-York.

[3] Ce village était appelé par les Anglais Pickawillany.

[4] La Demoiselle était le grand chef de la confédération des Miamis.

[5] " Les Miamis du village de la Demoiselle, ayant appris que j'étais près d'arriver chez eux, envoyèrent quatre chefs au devant de moi avec des calumets de paix pour me faire fumer....Lorsque nous fûmes tous assis, ils commencèrent leur cérémonie, et me présentèrent le calumet : je l'acceptai. Ils le présentèrent ensuite à M. de Contrecœur et à tous MM. les officiers et aux Canadiens, qui, fort affamés de fumer, auraient voulu que la cérémonie eût duré plus longtemps...." (Journal de Céloron.)

Deux partis de Miamis, l'un sous la conduite de la Demoiselle, l'autre sous la conduite du Baril, s'étaient, à l'instigation des Anglais, séparés du gros de leur nation établi à Kiskakou, près du fort Miamis, et avaient fondé deux nouveaux villages, l'un à la rivière à la Roche, l'autre à la rivière Blanche. M. Céloron les engagea à retourner à Kiskakou : " C'est dans cette terre, mes enfants, leur dit-il, que vous jouirez des douceurs de la vie, étant l'endroit où reposent les os de vos

Il faut maintenant traverser à pied le long espace qui sépare le village de la Demoiselle du fort Miamis :

" Après avoir brûlé nos canots et tout ce que nous ne pouvions pas emporter, nous prîmes congé de la Demoiselle le 20 septembre au matin.

" Notre traversée par terre ne fut que de cinq jours. Nous étions divisés en quatre brigades, commandées chacune par deux officiers. Nous marchions de file, parce que la petitesse du sentier ne nous permettait pas de nous étendre. Le chemin était passable, mais nous l'avons trouvé un peu long. A mon estime, le trajet de la Demoiselle aux Miamis peut avoir trente-cinq lieues.

" Nous avons traversé trois fois la rivière à la Roche, mais ce n'était plus qu'un faible ruisseau qui coulait sur quelques pieds de boue.

" Un peu plus qu'à mi-chemin nous commençâmes à côtoyer la rivière des Miamis [1], que nous avions à gauche. On y trouve de grosses écrevisses, et en abondance. De temps en temps nous avons marché dans de vastes prairies où l'herbe était quelquefois d'une hauteur démesurée.

" Arrivés chez M. Raymond [2], on acheta des pirogues et des provisions, et le 27 septembre après-midi on se mit en route pour aller au Détroit.

" Le fort des Miamis était en bien mauvais état quand nous y sommes passés. La plupart des pieux étaient pourris et tombaient en ruine. Il y a dedans huit maisons, ou pour mieux dire huit misérables chaumines, que l'envie seule de gagner de l'argent peut rendre supportables. Les Français y étaient au nombre de vingt-deux : tous, jusqu'au commandant, avaient la fièvre.

" M. Raymond n'approuve pas la situation du fort, et prétend qu'il serait beaucoup mieux placé sur le bord de la rivière Saint-Joseph, qui n'est éloignée de là que d'une petite lieue. Il voulut me faire voir cet endroit ; mais l'embarras de notre départ m'empêcha d'y aller. Tout ce que je pus faire pour lui, ce fut de lui tracer le plan de son nouveau fort. . . .

" C'est aux Miamis que j'appris qu'un peu avant d'entrer dans la rivière à la Roche nous avions passé à deux ou trois lieues des fameuses

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ancêtres et ceux de M. de Vincennes que vous avez tant aimé et qui vous a toujours gouvernés de façon que les affaires étaient toujours bonnes. Si vous avez oublié les conseils qu'il vous donnait, ses cendres vous en rappelleront la mémoire." Ils promirent de retourner à leur ancien village le printemps suivant.

Mais le Pied-Froid, chef des Miamis de Kiskakou, dit à Céloron : " Je souhaite de me tromper ; mais je suis assez attaché aux Français pour le dire : la Demoiselle mentira. Tout mon chagrin est d'être le seul qui vous aime, et de voir toutes les nations du sud déchaînées contre les Français."

[1] Ou rivière Maumee, comme disent les Anglais.

[2] M. Raymond était "capitaine et commandant aux Miamis" ; il avait avec lui un " interprète, nommé Roy". C'est le P. de la Morinie, de la Compagnie de Jésus, qui était à cette date missionnaire des Miamis.

salines, où sont ces squelettes d'animaux monstrueux. Cette nouvelle me mortifia fort ; et j'ai bien de la peine à me pardonner d'avoir manqué cette découverte. C'était la plus curieuse que je pusse faire dans mon voyage, et j'aurais été flatté de pouvoir vous en faire le détail." [1]

La rivière des Miamis conduisit tant bien que mal nos voyageurs jusqu'au lac Erié, où ils entrèrent le 5 octobre :

" Le 6, nous arrivâmes au bas de la rivière du Détroit, où nous trouvâmes des canots et des vivres pour notre retour. M. de Céloron eut la bonté de me permettre d'aller au fort avec quelques officiers : nous y passâmes toute la journée du 7. Je pris hauteur dans la tour du P. Bonaventure [2], et je la trouvai de 42° 38′."

Le P. de Bonnécamps fut enchanté de sa visite à Détroit :

" Sa situation, dit-il, m'a paru charmante. Une belle rivière passe au pied du fort. De vastes campagnes, qui ne demandent qu'à être cultivées, s'étendent à perte de vue. Rien de plus doux que le climat : à peine y compte-t-on deux mois d'hiver. Les fruits d'Europe, et surtout les blés y viendraient beaucoup mieux qu'en plusieurs cantons de la France.[3] C'est la Touraine et la Beauce du Canada.

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[1] "En 1739, un officier français, de Longueil, traversait, pour se rendre au Mississipi, les forêts vierges qui bordent le grand fleuve Ohio. Les sauvages qui l'escortaient trouvèrent par hasard, au bord d'un marais, divers ossements, dont plusieurs semblaient appartenir à des animaux inconnus. Dans ces marais tourbeux, que les indigènes désignent sous le nom de *Grand lac Salé*, venaient se perdre plusieurs sources d'eau chargée de sel, et de tout temps les ruminants sauvages y étaient accourus en foule, attirés par la saveur du sel, dont les animaux ont toujours été friands. De Longueil prit quelques-uns des ossements. A son retour en France, il les montra à Daubenton et à Buffon : c'était un fémur, une extrémité de défense et trois dents molaires.

"Buffon déclara que ces restes appartenaient à un éléphant, dont la race n'avait vécu qu'aux temps primitifs de notre globe. Ce fut alors que la notion fondamentale des espèces animales éteintes et exclusivement propres aux anciens âges de la terre entra, pour la première fois, dans la tête des naturalistes. Cette notion devait sommeiller près d'un siècle avant de porter les fruits admirables dont elle a enrichi les sciences naturelles et la philosophie.

" Buffon baptisa ce fossile du nom d'*animal de l'Ohio* ou *Eléphant de l'Ohio*.

"La découverte de cet animal fossile avait produit une grande impression en Europe. Maîtres du Canada par la paix de 1763, les Anglais continuèrent à y chercher ces restes précieux. Le géographe Croghan, parcourant de nouveau la région de ce *Grand lac Salé*, y trouva plusieurs ossements de la même nature." (*La Terre avant le Déluge*, par L. Figuier.)

[2] Le P. Louis-Marie-Bonaventure Carpentier, récollet, aumônier du fort de Détroit. Il desservit Sainte-Croix de Lotbinière et Sainte-Marie de Beauce, et mourut à Saint-Nicolas en 1778.

M. de Longueil était à cette date (1749) commandant à Détroit. Il fut remplacé par M. de Céloron en 1750. (*Rapport sur les Archives du Canada*, p. cliii.) C'est Belêtre qui était commandant à Détroit lors de la reddition de la place aux Anglais en 1760. (*The Conspiracy of Pontiac*, t. II, p. 167.)

[3] Le tabac qui se cultivait à Détroit était délicieux, paraît-il. Le P. de Bonnécamps, écrivant au P. Potier, qui se trouvait là en 1753, lui disait : " Envoyez-moi, je vous prie, par le porteur, quelques andouilles de tabac de la Pointe coupée ; je tâcherai de reconnaître...."

" De plus, on doit regarder le Détroit comme un des postes les plus importants de la colonie. Il est à portée de donner du secours à Michillimakinac, à la rivière Saint-Joseph, à la Baie (Verte), aux Miamis, aux Ouiatanons et à la Belle-Rivière, supposé qu'on y fasse des établissements. Ainsi, on ne saurait y jeter trop de monde.

" Mais où le prendre, ce monde ? Ce n'est pas au Canada : les colons que vous y envoyâtes l'année dernière se sont contentés de manger la ration que le roi leur donnait ; quelques-uns même d'entre eux, emportés par leur légèreté naturelle, ont quitté le pays et sont allés chercher fortune ailleurs. Combien de pauvres laboureurs, en France, seraient charmés de trouver un pays qui leur fournirait abondamment de quoi les dédommager de leurs travaux et de leurs sueurs !

" Le fort du Détroit est un quarré long ; je n'en sais pas les dimensions, mais il m'a paru grand. Le village des Hurons et celui des Outaouais sont de l'autre côté de la rivière,[1] où le P. de la Richardie m'a dit que les rebelles commençaient à venir à résipiscence, et que la bande de Nicolas diminuait tous les jours. Nous avons demandé de ses nouvelles dans la Belle-Rivière, et l'on nous a dit qu'il avait établi sa résidence aux environs du lac Erié."

Le corps expéditionnaire fit son retour par le lac Erié, où le P. de Bonnécamps prit hauteur à deux endroits, la pointe Pelée et la pointe à

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[1] Ces sauvages étaient desservis par les jésuites. La mission s'appelait " la mission huronne éloignée ", pour la distinguer de " la mission huronne près Québec ", ou bien " la mission de l'Ile-aux-bois-blancs ". Voici les religieux qui étaient à cette mission en 1749 : Armand de la Richardie, Jean-Baptiste-François de Salleneuve, Pierre-Daniel Richer, Pierre Potier, et le frère Pierre Gournay (dit la Tour). (*Catalogus Provinciæ Franciæ.*)

Le P. Potier était supérieur de la mission de l'Ile-aux-bois-blancs en 1746 M. Navarre, notaire royal à Détroit, lui écrivant le 17 août de cette année, adressait sa lettre " au R. P. Potier, très digne prêtre de la Compagnie de Jésus, supérieur de la mission des Hurons à l'Ile aux Bois Blancs ".—" M. de Longueil se fait une joie de vous aller voir, lui disait-il, sitôt que les affaires de son poste seront terminées. Il me promet de me mener avec lui....Nous avons, ajoutait-il, un petit enfant bien malade depuis six jours qu'il n'a pris aucune nourriture ; c'est notre petit garçon. Je vous prie, mon Père, de vouloir bien le recommander à Notre-Seigneur dans vos saints sacrifices. Je ne demande que la gloire de Dieu.... "

Le P. Potier tenait un journal de tous les événements, grands et petits, dont il avait connaissance. Ce cahier ne manque pas d'intérêt, comme on peut en juger par quelques lignes prises au hasard en 1746 :—" Mai, le Canada ravitaillé.—2,000 Canadiens partent pour l'Acadie.—Août, Degrais (fils du baron de Longueil) fait 53 prisonniers anglais à l'île Saint-Jean.—Quai bâti à Québec pour la construction des vaisseaux.—Le nouveau chantier.—Septembre, coups de M. Rigaud....Prend et brûle un fort près d'Orange.—Octobre, deux charpentiers tués à l'île Lamotte par les Agniers.—Coup de Soulanges, douze personnes prises ou tuées.—Le P. Richer refuse la supériorité.—30 décembre, M. de Longueil reçoit la croix de Saint-Louis.—Forts bâtis dans les côtes du Canada avec garnison." (Archives du collège Sainte-Marie de Montréal.)

la Biche. On passa trois jours à Niagara, puis l'on se remit en marche, côtoyant la rive sud du lac Ontario :

" Nous avons essuyé dans ce lac des temps affreux, écrit le P. de Bonnécamps : plus d'une fois nous avons été sur le point de périr.[1] Enfin, malgré les vents et les tempêtes, nos canots d'écorce nous ont rendus sains et saufs à Catarakoui le 4 novembre."

On demeura trois jours à Catarakoui, puis l'on descendit les rapides, et l'on arriva à Montréal le 10 novembre. Le 14, Céloron et le P. de Bonnécamps se mirent en marche pour Québec, où ils arrivèrent le 18.

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Nous avons cru devoir consacrer un espace considérable à ce voyage, d'abord parce qu'il occupe une place très importante dans la vie du P. de Bonnécamps, puis, parce que le récit de cette expédition, dont on a pu apprécier la valeur littéraire, est à peu près le seul écrit qui nous reste de cet homme savant.

Outre cet écrit, en effet, et le petit travail publié dans les *Mémoires de Trévoux*, nous n'avons de lui qu'une lettre de peu d'importance, datée du fort Frontenac le 25 juin 1752, et adressée au P. Potier, alors en mission à l'île aux Bois-Blancs. Nous en détachons quelques lignes qui expliquent la présence, à cette date, du P. de Bonnécamps au fort Frontenac :

" Mon Révérend Père, je prends la liberté de vous écrire. Vous serez peut-être étonné de la date de ma lettre, car vous me croyez à Québec, et je n'y suis pas ; ains au rebours j'en suis à cent vingt lieues ; non, Dieu merci, pour y demeurer, mais en passant, et pour y faire des observations astronomiques avec un quart de cercle que le ministre a eu la bonté de m'envoyer. . . ."

Il le tenait donc, enfin, ce quart de cercle qu'il avait fait demander par l'intendant dès 1744, puis en 1748. S'il l'avait eu dans son voyage à la Belle-Rivière, comme il eût fait ses observations avec plus de précision et de contentement ! Il n'eût pas été obligé de s'excuser auprès de M. de la Galissonnière de l'imperfection de ses calculs et de ses travaux hydrographiques.

Nous ne croyons pas que le voyage du P. de Bonnécamps au fort Frontenac, en 1752, pour y faire des observations astronomiques, soit un fait isolé. Au contraire, tout nous porte à supposer qu'il lui arrivait souvent de faire de pareilles excursions, tantôt à un endroit, tantôt à un

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[1] Voici ce que Chrétien Leclerq écrit au sujet du lac Ontario : " Ce lac est assez profond pour de grands navires, ne se trouvant pas de fond à soixante-dix brasses. Les ondes agitées par les vents qui y sont fréquents s'élèvent aussi haut que celles de la mer, et sont plus périlleuses parce qu'elles sont plus courtes et se précipitent davantage ; en sorte que le navire obéit moins à la lame. . . ." *(Premier Etablissement de la Foy*, t. II, p. 108.)

autre, au profit de la science, de l'instruction de ses élèves et de la réputation du collège de Québec.[1]

Puis, rentré dans sa cellule, il reprenait ses études avec une ardeur toujours nouvelle, et travaillait à rendre son enseignement de plus en plus pratique et proportionné aux besoins des temps.

Les catalogues et les documents de l'époque nous le montrent sans interruption professeur de mathématiques et d'hydrographie depuis son arrivée au collège de Québec jusqu'à son départ pour la France en 1759.

Ils nous le montrent aussi occupé au ministère des âmes, confessant à l'église, dirigeant dans la voie du bien les citoyens qui s'adressaient à lui. Peu de temps avant son voyage au fort Frontenac pour y faire des observations astronomiques, il y avait eu un jubilé à Québec :[2] le P. de Bonnécamps recueillit sans doute une riche moisson spirituelle avant d'aller récolter celle de la science.

Une seule année (1757), le nom du P. de Bonnécamps disparaît du catalogue. . . . Le père était passé temporairement en France dans lecours de l'automne. Quel était le but de son voyage ? Il y avait quinze ans qu'il était au Canada—*Quindecim annos, grande mortalis ævi spatium*[3], — il y avait dix ans qu'il avait fait, le 8 décembre 1746, dans l'église des jésuites à Québec, la profession solennelle des quatre vœux[4], en présence du P. de Saint-Pé, alors supérieur des missions de l'Amérique, et des PP. Floquet[5]

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[1] Le 20 juillet 1753, le R. P. Billiard reçut commission pour faire les fonctions de géographe du Roy " en l'absence du P. de Bonnécamps ".

[2] Le jubilé universel de Benoit XIV. Il eut lieu à Québec du 16 janvier au 15 juillet 1752. (*Mandements des Evêques de Québec*, t. II, p. 83.)

[3] Tacite, *Vita Agricolæ*.

[4] Ces quatre vœux solennels sont ceux de pauvreté, de chasteté et d'obéissance, et le vœu spécial d'obéir au moindre signe de la volonté du souverain pontife pour aller dans les missions étrangères ou n'importe où le vicaire de J.-C. voudrait les envoyer. Les jésuites qui font la profession solennelle des quatre vœux sont appelés profès. C'est parmi eux que le général et les provinciaux sont choisis.

[5] René Floquet, né le 12 septembre 1716, entra dans la Compagnie de Jésus le 6 août 1735. Il était de la province d'Aquitaine. Il arriva au Canada le 17 août 1744, et fit la profession des quatre vœux dans l'église des jésuites à Montréal le 16 juillet 1752. Il mourut à Québec le 18 octobre 1782.

Il était à la résidence de Montréal en 1775, et fut accusé de favoriser la cause de l'indépendance américaine. De fait, il est question de lui dans une lettre d'un officier américain, Moses Hazen, à son ami Antill. Cet officier, envoyé à Montréal pour soulever les Canadiens, se plaint un peu des obstacles qu'il rencontre, et ajoute : " Père Floquette has assisted by giving them (the Canadians) absolutions when every other Priest refused. He has now the name of my chaplain. . . . "

Il est question aussi du P. Floquet dans une lettre de M. Monforton, adressée de Détroit à M. Cerré aux Illinois. M. Monforton, parlant de l'indépendance, que les Américains n'ont pu acheter que " par l'effusion du sang ", l'appelle une idole : " Cette idole, dit-il, à laquelle ils ont sacrifié tant d'innocentes victimes, n'a à présent que trop d'adorateurs dans cette partie de l'Amérique, au nombre desquels on a compté le P. Floquet. S'il est coupable de quelque trahison, il a été sans doute d'autant plus dangereux que sa correspondance a été trop longtemps cachée. En ce cas, ceux qui font quelque connaissance de l'institut de sa Compagnie de Jésus,

et Canot [1]. Il est probable qu'il avait demandé et obtenu de ses supérieurs la permission d'aller revoir son pays natal, d'aller se retremper au foyer fraternel de la maison professe à Paris, de prendre quelques mois de repos dont sa santé pouvait avoir un grand besoin. [2]

Il quitta Paris le 25 mars 1758 pour retourner au Canada, et alla s'embarquer à la Rochelle [3] avec le P. de Glapion [4]. Ils arrivèrent au bout de quelques semaines à Québec ; et l'on trouve leurs noms sur le catalogue de 1758. Le P. de Bonnécamps y figure de nouveau comme professeur d'hydrographie au collège.

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Hélas ! la Nouvelle-France était à la veille d'une grande catastrophe, que faisaient prévoir depuis longtemps l'épuisement de ses forces intérieures et les attaques acharnées et persévérantes de ses ennemis.

La guerre est partout, à Louisbourg, à Carillon, au fort Duquesne à Frontenac : les jeunes gens, les chefs de famille s'enrôlent dans les cadres de nos officiers et courent à la défense de la patrie.

Tout est en souffrance, l'agriculture, l'industrie, le commerce. Les familles, réduites à l'indigence, n'ont guère le temps de songer à l'éducation et à l'instruction de leurs enfants.

On se figure aisément la désastreuse influence de toutes ces circonstances sur le cours d'études classiques au collège de Québec en 1758. Les classes du P. de Bonnécamps n'étaient-elles pas désertes ? N'était-il revenu au Canada que pour assister à la ruine de tout ce qu'il avait de plus cher ?

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doivent savoir la différence qu'il y a entre un franc jésuite et un jésuite franc...." (Archives du Canada, Collection Haldimand, B. vol. CXXII, p. 161 ; vol. XXVII, p. 398.)

Nous avons lu les lettres d'explications, d'excuses et de soumission du P. Floquet à l'évêque de Québec, Mgr Briand, qui l'avait interdit : elles respirent une grande candeur et le plus sincère esprit religieux.

[1] Claude-Joseph-Marie Canot arriva à Québec en 1740, en même temps que Mgr de l'Aube-Rivière. Il était professeur de théologie au collège en 1746 et 1749. On connaît la "Relation du voyage de feu Mgr de l'Aube-Rivière et de sa mort : lettre écrite de Québec le 30 août 1740 par le P. Canot, jésuite de Dôle ".

[2] Le sieur Pellegrin reçut une commission d'hydrographe pendant l'absence du P. de Bonnécamps ; elle est datée du 10 septembre 1757.

[3] Archives du collège Sainte-Marie de Montréal.

[4] Augustin-Louis de Glapion était à Québec comme simple scholastique en 1746, et partit l'année suivante pour aller faire sa théologie au collège Louis-le-Grand à Paris. Il mourut à Québec le 24 février 1790 : "Issu d'une famille noble et ancienne, . . . il n'était pas moins estimable par la bonté de son cœur que par sa naissance et ses talents. Le clergé perd en lui un prêtre zélé, pacifique, et un fervent religieux ; les hôpitaux, un soutien aussi généreux que compatissant." (*Les Ursulines de Québec*, t. III, p. 346.)

En 1759, la situation ne fit que s'assombrir : et les classes du collège, fermées lorsque commença le siège,[1] ne se rouvrirent plus.....[2]

Le Catalogue de 1759 ne mentionne plus le P. de Bonnécamps parmi les pères résidant au Canada. Il était repassé en France. Mais à quelle date ? Il est probable qu'il ne s'éloigna de Québec que dans le cours de l'automne, après la capitulation, avec la plupart de ses confrères,[3] emportant le souvenir de toutes les horreurs du triste et long siège auquel il lui avait été donné d'assister, la lugubre image de la cathédrale de Québec incendiée, l'image surtout de son cher collège et de sa chère église tristement ravagés par les boulets de l'ennemi, de cette église où il avait prononcé ses vœux, de ce collège où il avait enseigné durant tant d'années.[4]

Il alla résider à Caen, dans le collège de la Compagnie de Jésus, et y enseigna les mathématiques. C'est là que le surprirent les décrets de 1762, supprimant la Compagnie et enlevant aux jésuites le droit d'enseigner en France.

A partir de cette date, on ne retrouve nulle part le nom du P. de Bonnécamps. Il n'est pas dans l'*Etat des Jésuites du Ressort du Parlement de Paris en* 1762, et l'on ne connaît ni l'endroit ni la date de la mort

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[1] " Dès le commencement du siège de cette ville en 1759, les classes furent fermées, et les élèves s'enrôlèrent pour la défense de la place." *(Notice historique sur le Petit Séminaire de Québec*, dans l'*Abeille*, t. II, nº 13.)

[2] " M. Pressart, supérieur du séminaire de Québec, et M. Gravé suivirent Mgr de Pontbriand à Montréal, avant la fin du siège. Les ecclésiastiques et les écoliers qui en avaient le moyen en firent autant, de sorte que M. Pressart crut pouvoir continuer les conférences de théologie, pendant que M. Gravé instruisait les philosophes. La mort de l'évêque (8 juin 1760), suivie de la capitulation de Montréal, dispersa ce qui restait d'élèves....

" En 1765, au commencement d'octobre, le Petit Séminaire recommença à prendre des pensionnaires. Il y avait six ans, c'est-à-dire depuis le siège de Québec en 1759, qu'il n'y en avait point eu.

" Le premier dont le nom se présente sur la liste est Michel-Ignace de Salaberry, de Beauport, âgé de 13 ans....C'est le père du héros de Châteauguay.

" En 1768, le Petit Séminaire, jusque là exclusivement composé de pensionnaires, fut modifié de manière à admettre les externes, qui autrefois allaient chez les Jésuites. Le collège de ces religieux avait été changé en casernes...." *(Ibid.)*

Knox écrit, à la date du 13 novembre 1759 : " *The Jesuits have received orders to depart the town as soon as possible*". *(Knox's Historical Journal*, t. II, p. 179.)

De son côté, Mgr de Pontbriand écrivait, à la date du 5 novembre : " Les prêtres du séminaire, les chanoines, les Jésuites sont dispersés dans le peu de pays qui n'est pas encore sous la domination anglaise." *(Les Evêques de Québec*, par Mgr Têtu, p. 252.)

[4] " L'église cathédrale a été entièrement consumée. Dans le Séminaire, il ne reste de logeable que la cuisine, où se retire le curé de Québec (M. Récher) avec son vicaire.... L'église de la Basse Ville est entièrement détruite ; celles des récollets, des jésuites et du Séminaire sont hors d'état de servir, sans de très grosses réparations.... Le palais épiscopal est presque détruit et ne fournit pas un seul appartement logeable ; les voûtes ont été pillées. Les maisons des récollets et des jésuites sont à peu près dans la même situation ; les Anglais y ont cependant fait quelques réparations pour y loger des troupes." *(Ibid.)*

de cet homme de bien. Il est probable qu'il continua à résider à Caen, se mit à la disposition de l'évêque de l'endroit, et se rendit utile jusqu'à sa mort dans le ministère sacerdotal.

"Les jésuites, privés du droit d'enseigner et de se réunir, dit le P. de Rochemonteix, se dispersèrent dans les villes et dans les campagnes, continuant à faire le bien par la prédication et par la confession, fidèles à la direction qui leur venait de Rome. Les évêques les prirent partout sous leur haute protection et les employèrent le plus possible dans les fonctions du saint ministère. Ils vivaient dans la pauvreté, beaucoup même parmi eux dans la misère, mais leur zèle ne restait pas inactif." [1]

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Il y a quelques années, alors que l'on achevait de démolir le vieux collège des Jésuites à Québec, notre distingué collègue de la Société royale, M. Faucher de Saint-Maurice, écrivait :

"Dans quelques jours, il ne restera plus rien de ce qui fut, pendant cent quatorze ans, l'*alma mater* de l'Amérique du Nord. Plus vieux d'une année que le collège de Harvard, près de Boston, celui des jésuites de Québec n'existera plus maintenant que dans les souvenirs de ceux qui ont la fierté de leur passé.

"Avant qu'il ne disparaisse complètement, la province de Québec ne doit-elle pas une marque de souvenir à ceux qui furent ici les plus vaillants et les plus saints d'entre les vaillants et les saints ; à ceux qui, sans espoir de reconnaissance en ce monde, ont travaillé sans relâche pour Dieu pour la patrie, et qui, tout en s'ignorant eux-mêmes, furent des héros, des savants et des martyrs ?"

Puis il ajoutait :

"Une chapelle ou un monument élevé sur le terrain occupé jadis par le collège, et construit aux frais de la province de Québec, ne serait-il pas une marque convenable de son respect et de son pieux souvenir ? .... Un monument ou un édifice religieux rappelant à l'Amérique du Nord les noms de tous les pères, de tous les frères jésuites qui ont illustré l'ordre dans la Nouvelle-France, ne serait-il pas la meilleure manière d'enseigner l'histoire aux générations à venir, et ne servirait-il pas, autant que n'importe quel autre moyen, les fins de l'instruction publique dans la province de Québec ?" [2]

Quinze ans se sont écoulés depuis que ces nobles paroles ont été écrites ; et rien n'est encore fait.... Patientons. L'idée exprimée par

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[1] *Le Collège Henri IV de la Flèche*, t. IV, p. 314.

[2] *Relation de ce qui s'est passé lors des fouilles faites par ordre du gouvernement dans une partie des fondations du collège des Jésuites de Québec, 1879.*

M. de Saint-Maurice est trop belle et trop généreuse pour se perdre. Elle aura bien été remarquée et saisie par quelques-uns de nos hommes publics les plus éminents : elle germera tôt ou tard dans leur âme, et produira son fruit.

Oui, espérons-le, on le verra un jour, ce monument, à l'endroit où s'élevaient ce collège et cette magnifique église, que tout le monde regrette. On y verra écrits en lettres d'or les noms des premiers missionnaires de notre pays, des premiers éducateurs de la jeunesse canadienne ; et parmi ces héros, ces martyrs, ces apôtres, ces savants distingués, on lira avec reconnaissance et amour le nom du P. de Bonnécamps.

III.—*A propos de notre littérature nationale.*

Par NAPOLÉON LEGENDRE.

(Lu le 16 mai 1895)

Il peut paraître singulier à plusieurs personnes que je vienne parler ici de notre littérature nationale, puisqu'on prétend que nous n'avons pas de littérature canadienne proprement dite, et que ce qui est écrit par nous fait partie des lettres françaises.

Malgré tout ce qu'il y a de flatteur pour notre amour-propre dans cette glorieuse confusion de nos écrits avec la plus grande, la première littérature du monde entier, je ne suis pas prêt à faire cette admission ; au contraire, je crois que nous avons une littérature qui est bien à nous, et qui, tout en revêtant autant que possible la forme française, c'est-à-dire la forme la plus rapprochée de la perfection idéale, n'en reste pas moins profondément et véritablement canadienne.

C'est peut-être un phénomène assez rare, mais qui, toutefois, n'est pas sans exemple, puisqu'il se retrouve tout près de nous, chez nos voisins des Etats-Unis, où les lettres, tout en se servant de la langue de Shakespeare, conservent néanmoins tous les caractères distinctifs de leur nouvelle nationalité.

Notre littérature ne date pas de bien loin, car notre histoire elle-même n'embrasse qu'une époque tout à fait récente ; mais elle a déjà accompli une marche ascendante assez remarquable, si l'on considère les circonstances dans lesquelles elle a dû se produire et se développer.

Les hardis pionniers qui colonisèrent le sol de la Nouvelle-France, devenu pour nous le sol de la patrie, n'avaient pas le loisir de songer aux arts ou aux lettres ; mais, avec la pointe de leur sabre, le tranchant de leur hache, ou le soc de leur charrue, ils ont écrit en caractères ineffaçables sur la surface du pays, de glorieuses et sublimes pages qui forment, en quelque sorte, l'héroïque préface de notre histoire nationale. Ces époques étaient des jours de luttes et de batailles, une littérature en action. Les seuls accents qui éveillassent les échos du grand fleuve et les solitudes de nos forêts étaient les notes stridentes de la trompette et du clairon, les détonations du mousquet, les cris de triomphe des vainqueurs et les plaintes de ceux qui étaient tombés.

Mais, ces temps d'épreuve, de dévoûment et de sacrifices n'ont pas été perdus pour les lettres de notre pays. Beaucoup de ces actions valeureuses ont été écrites succinctement par les chroniqueurs de l'époque ; et ces relations forment la mine abondante qu'ont exploitée plus tard et qu'exploitent encore aujourd'hui tous ceux qui veulent s'inspirer aux

sources mêmes des hauts faits les plus grands et les plus beaux de l'humanité.

Pendant les époques de trève, toutefois, les *voyageurs* s'enfonçaient dans les forêts immenses du continent, explorant les montagnes, les prairies, les lacs et les rivières dont les magnificences se révélaient partout à leurs regards étonnés. Ils établissaient des postes qui devaient former, plus tard, des paroisses, des villages et des villes. C'est pendant ces courses aventureuses que le Canadien montrait ce qu'il a toujours été, et ce qu'il restera toujours, je l'espère, un héros au besoin, mais un héros doublé d'un artiste. Ses hauts faits, il les chantait lui-même, simplement et de la même façon qu'il les accomplissait, c'est-à-dire instinctivement et presque sans s'en douter. De là ces chants nombreux qui, empruntés d'abord, par le procédé de l'assimilation, aux mélodies populaires de l'ancienne France, ont fini par se transformer et se développer et devenir les véritables "complaintes" canadiennes, si pleines de charme et de sentiment, dont la complainte de Cadieux, ou Cayeux, est peut-être un des plus touchants exemples.

Pour l'avantage de ceux qui ne connaissent pas cette complainte, je vais la citer en entier, telle qu'on la trouve dans le précieux et savant recueil de M. Ernest Gagnon : *Les Chansons du Canada.*

Petit rocher de la haute montagne,
Je viens ici finir cette campagne ;
Ah ! doux échos, entendez mes soupirs ;
En languissant je vais bientôt mourir.

Petits oiseaux, vos douces harmonies,
Quand vous chantez, me rattach' à la vie ;
Ah ! si j'avais des ailes comme vous,
Je s'rais heureux avant qu'il fût deux jours.

Seul en ces bois, que j'ai eu de soucis !
Pensant toujours à mes si chers amis,
Je demandais, hélas ! sont-ils noyés ?
Les Iroquois les auraient-ils tués ?

Un de ces jours, que m'étant éloigné,
En revenant, je vis une fumée ;
Je me suis dit : Ah ! grand Dieu, qu'est ceci ?
Les Iroquois m'ont-ils pris mon logis ?

Je me suis mis un peu à l'ambassade,
Afin de voir si c'tait une embuscade;
Alors, je vis trois visages français.
M'ont mis le cœur d'une trop grande joie.

Mes genoux plient, ma faible voix s'arrête ;
Je tombe ; hélas ! à partir ils s'apprêtent !
Je reste seul, pas un qui me console,
Quand la mort vient par un si grand désole.

Un loup hurlant vient près de ma cabane,
Voir si mon feu n'avait plus de boucane ;
Je lui ai dit : retire-toi d'ici !
Car, par ma foi, je perc'rai ton habit.

Un noir corbeau, volant à l'aventure,
Vient se percher tout près de ma toiture ;
Je lui ai dit : mangeur de chair humaine,
Vas-t'en chercher d'autre chair que la mienne !

Vas-t'en là-bas, dans ces bois et marais,
Tu trouveras plusieurs corps iroquois ;
Tu trouveras des chairs, aussi des os ;
Vas-t'en plus loin, laisse-moi en repos !

Rossignolet, va dire à ma maîtresse,
A mes enfants, qu'un adieu je leur laisse ;
Que j'ai gardé mon amour et ma foi,
Et désormais, faut renoncer à moi !

C'est donc ici que le mond' m'abandonne ;
Mais j'ai recours en vous, Sauveur des hommes ;
Très sainte Vierge, Ah ! m'abandonnez pas ;
Permettez-moi d'mourir entre vos bras.

Et, remarquons, en passant, que, sous le rapport de ses commencements, notre littérature n'est pas un exemple unique. Toutes les littératures ont commencé de la même manière, dans le peuple, et par la chanson. Chacun de vous, Messieurs, a lu les fameuses *chansons de geste* qui forment les premières étapes de la littérature de France.

La *Chanson de Roland*, la mieux connue de toutes, est considérée à bon droit comme une espèce d'épopée et comme le portique qui donne accès à ce temple si riche et si majestueux qui s'appelle la littérature française.

Les anciens troubadours, qui allaient par les châteaux, célébrer dans leurs chansons les exploits des preux des âges antiques, étaient en réalité les ancêtres légitimes de nos chansonniers voyageurs. Seulement, nos voyageurs ne pouvaient pas aller colporter leurs œuvres dans les châteaux, d'abord, parce que nous n'avions pas de châteaux, et ensuite, parce que ces hardis découvreurs avaient bien d'autres courses à faire dans lesquelles ils devaient porter autre chose que des guitares et des mandolines.

Leurs chants, la plupart du temps, n'étaient pas même écrits, mais se perpétuaient dans les familles par la tradition. Il est vrai que, dans ce passage à travers les familles, ils subissaient bien des variantes, des additions et des retranchements ; mais l'idée principale surnageait, et c'était le point le plus important. La chanson de Cadieux, que je viens de citer, a eu un meilleur sort ; elle a été écrite sur des écorces de bouleau, et c'est ainsi qu'elle a pu faire sans danger le voyage à travers les années.

La lutte qui s'était faite avec les bêtes féroces et avec les sauvages, souvent plus féroces encore, recommença plus tard avec les autres Européens qui étaient venus s'établir sur ce continent. Puis, le malheur s'abattit sur les armes françaises ; nous fûmes brusquement séparés de notre mère-patrie et placés sous un drapeau étranger. Aujourd'hui, ce grand deuil est effacé ; mais quelles larmes brûlantes il a fait couler alors ! Et cependant, d'un autre côté, quel vaste champ pour le poète qui ne craignait pas d'entrer sur ce terrain dangereux et qui, sans oser parler pour ses

contemporains, se sentait de force à faire entendre sa voix dans l'avenir ! Quelle mine inépuisable, aussi, pour nos poètes d'aujourd'hui !

Après plusieurs années, les luttes recommencent ; mais ce n'est plus seulement pour la vie matérielle que nos pères combattent ; c'est pour leur existence politique et nationale ; c'est pour leur langue et leur religion.

A mesure que l'action s'engage, les hommes de talent surgissent, sortent des rangs et se jettent à l'avant-garde. C'est là une grande page d'histoire et une belle époque de notre littérature, littérature toute d'improvisation et d'élan spontané, mais pleine de ces grands mouvements qui ne peuvent provenir que des grands cœurs et des grandes situations. Malheureusement, la plupart de ces travaux ne sont connus que par la tradition et par les résultats qu'ils ont produits, ou encore, par les réponses violentes et les cris de douleur qu'ils ont souvent provoqués chez les adversaires. A cette époque encore, on n'avait pas le temps d'écrire, et, même quand l'auteur écrivait, son unique manuscrit, emporté par la tourmente, ne lui survivait pas. Seulement, on racontait, le soir, au coin du feu, comment nos grands tribuns avaient défendu les droits du peuple et forcé le despotisme à compter avec nous.

Plus tard encore, au prix de sacrifices innombrables, des journaux furent fondés et prirent part à la lutte, lutte du pot de terre contre le pot de fer, et dans laquelle cependant, le premier a fini par triompher. Le propriétaire du journal était à la fois rédacteur, imprimeur et colporteur de sa feuille ; et il avait, en outre, tous les dangers extérieurs à redouter ; car on emprisonnait les écrivains, on confisquait les presses, on saccageait les ateliers. Mais, rien ne pouvait abattre le courage des nôtres qui voulaient que leur voix fût entendue ; et malgré les cris étourdissants qui cherchaient à l'étouffer, cette grande voix se faisait entendre et allait, par tout le pays, ranimer le courage du peuple et faire trembler les oppresseurs.

Et par quels efforts héroïques, par quelle patience surhumaine, par quelles souffrances de chaque jour, on est parvenu à faire ainsi retentir constamment le cri d'alarme et de ralliement, ceux-là seuls l'ont compris qui ont été les acteurs de ces drames palpitants, qui se sont tenus jour et nuit sur la scène et qui sont morts sous leur glorieux harnais. Ils ont été si grands et si forts, que leur seul souvenir suffit aujourd'hui pour soutenir ceux qui sont dans l'arène et qui combattent, non pas les rudes et enivrants combats d'autrefois, mais les combats presque aussi difficiles, sous un certain rapport, où la force ouverte et la violence sont remplacées par la diplomatie et la sourde insinuation ; où la lutte face à face et en pleine lumière a fait place aux embûches de nuit et à de subtils enveloppements.

C'était alors ce que je pourrais appeler l'époque de la littérature militante ; et si elle n'est pas la plus brillante au point de vue de la forme, ce n'est certes pas la moins glorieuse sous le rapport de la vigueur et de l'inspiration.

Ensuite, les temps deviennent plus calmes et nous entrons dans une période de plus grande liberté. Nos littérateurs ont un autre rôle à remplir. Ils ont à recueillir les grandes leçons du passé, à les transcrire pour les offrir à l'admiration de leurs contemporains et les donner en exemple aux générations futures. Ils ont pour mission de tenir constamment devant les yeux du peuple les belles actions de ceux qui ont combattu et qui sont morts pour affirmer et faire respecter ses droits, afin que les courages, n'étant plus aiguillonnés par les ardeurs de la lutte ouverte et active, aient du moins pour les soutenir, le spectacle des grandes choses qui se sont déjà accomplies, la vue rétrospective d'une époque héroïque, l'exemple des fortes vertus qui ont élevé si haut le nom de nos patriotes canadiens.

Et ici, Messieurs, je pourrais citer bien des noms que vous avez déjà sur les lèvres, tant parmi ceux qui ne sont plus que parmi ceux qui restent encore à l'œuvre. Je n'en offrirai cependant qu'un seul à votre affectueuse admiration, c'est celui qui est inscrit sur un des plus beaux monuments élevés à l'honneur de notre race et au souvenir de ceux qui ont bien mérité de la patrie, comme aussi à la réprobation de ceux qui ont voulu l'abaisser et l'anéantir : c'est le nom de notre grand historien, François-Xavier Garneau.

Voilà, Messieurs, jusqu'à l'époque qui nous touche de plus près, jusqu'à nos jours, ce qu'a été notre littérature. Née sur ce sol dans les combats et les luttes, son enfantement a été long et laborieux. Livrée à ses propres forces, elle s'est vue assaillie de toutes parts et obligée même de combattre pour conserver la belle langue dans laquelle elle traduisait ses impressions. Et cependant, elle a grandi, elle s'est développée dans le sacrifice et le dévoûment. Forcée de tout créer, de tout inventer, comme l'artisan qui, avant de travailler à son œuvre, serait obligé de forger ses propres outils, elle a eu à renverser tous les obstacles, à combattre les plus étranges préjugés. Vous vous rappelez encore le temps — il n'est pas déjà si loin de nous — où le titre d'écrivain conférait à celui qui le portait un brevet d'incapacité, où le nom de poète provoquait sur toutes les figures un sourire de pitié à peine dissimulé ; où, loin de pouvoir attendre de son travail un juste salaire, le littérateur devait s'estimer heureux quand l'imprimeur consentait à ne pas lui faire payer l'honneur de paraître dans les colonnes de son journal. Eh ! bien, ces outrages, nos écrivains les ont subis — j'en sais quelque chose — ces obstacles, ils les ont renversés, ces actes de dévoûment, il les ont patiemment et virilement accomplis !

Et en présence de ces faits, on viendrait soutenir que nous n'avons pas de littérature nationale proprement dite ! qu'il n'existe pas une telle chose que les lettres canadiennes-françaises !

Ah ! Messieurs, elle est bien canadienne cette littérature, ils sont bien à nous ces écrits qui représentent la plus noble, la plus intime partie de nous-mêmes, lambeaux de notre cœur que nous avons arrachés quand il nous fallait cependant ce cœur tout entier pour soutenir la lutte.

Ah ! on ignore trop, en général, ce qu'un livre coûte de travail à son auteur ! Longues études, patientes recherches, journées de fatigue et nuits sans sommeil ! Chacune de ces pages — que vous lisez assez souvent d'un œil indifférent et peut-être moqueur — représente une des fibres de notre vie. Ces strophes, d'une allure si facile qu'on dirait qu'elles se sont faites toutes seules, ont tenaillé le cerveau et le cœur de celui qui les a écrites, avant de s'envoler, caressantes et douces, vers votre œil distrait ; elles l'ont fait pleurer avant de vous donner une tranquille émotion !

Regardez entre chacune de ces lignes qui vous parlent quelquefois si gaîment pour solliciter votre rire joyeux, vous verrez surgir la vision d'une mansarde sans feu, peut-être d'une journée sans pain. A travers ces somptueuses descriptions de riches demeures, d'apartements luxueux, de banquets, de bals et de festins, vous verrez la face grimaçante et la main décharnée de la pauvreté et de la misère sans espoir. Et c'est dans cette douleur, dans cette souffrance de tous les jours et de toutes les nuits qu'est née cette page souriante, toute frémissante encore des sanglots qui l'ont secouée, humide aussi, très souvent, des larmes qui l'ont trempée !

Ah ! les lettres ne constituent pas un métier comme les autres métiers ; on ne l'embrasse pas et on ne le quitte pas à son gré. C'est une véritable vocation ; elle a ses appelés : il faut qu'ils répondent ; il faut qu'ils viennent, à son jour, à son heure. Elle a ses passionnés, comme la mer qui captive le matelot et le retient dans les mille replis de ses ondes caressantes ou couroucées. Quand je songe à l'homme qui s'est donné à la littérature, je me rappelle toujours ces strophes que j'ai lues dans ma jeunesse et dans lesquelles un poète dont je ne sais plus le nom a essayé de peindre la passion du marin pour l'élément qu'il a choisi :

LA MER.

La mer ! à moi la mer et sans fond et sans rive,
La mer ! vaste pâture au cœur audacieux ;
La mer, qui dans ses bras tient la terre captive
Et mêle son abîme à l'abîme des cieux !

La mer, calme et riante où l'azur se reflète,
La mer, comme un enfant jouant dans son berceau ;
La mer où je naquis dans un jour de tempête,
La mer, sein maternel, tu seras mon tombeau !

O mer, je ne veux pas d'un autre cimetière ;
Quand la mouette aura chanté sur mon trépas,
Quand les plis de tes flots m'auront fait un suaire,
Sur le bord détesté ne me rejette pas !

La terre à mon sommeil serait dure et pénible ;
Jalouse de garder les cendres d'un amant,
Ne cède qu'à l'appel de la trompe terrible
Et ne me rends qu'au jour du dernier jugement !

Telle est la vocation de l'homme de lettres. Elle empoigne son existence ; elle commande, il faut marcher. Obstacles, défenses, décourage-

ments, moqueries, rien n'y fait. Celui en qui Dieu a mis cette étincelle vivante ne peut l'éteindre ; et, s'il ne la fait pas servir à rayonner au dehors, elle concentre son feu au dedans et le consume lui-même.

Et c'est là le secret de bien des existences dévoyées ou brisées, de bien des chutes retentissantes, de bien des morts prématurées et de tant de ces passages étincelants et rapides qui ont laissé dans le monde une traînée lumineuse et qui, comme les météores de la nuit, se sont effacés dans les ténèbres de l'oubli, sans pouvoir imprimer un sillon permanent.

Quand vous lirez un livre, pensez bien à toutes ces choses. Pensez à cette intelligence qui s'est détachée, en quelque sorte, de tout ce qui l'entoure, pour s'emprisonner dans une idée, comme le marin s'emprisonne dans sa barque. Pensez à ce cœur qui s'est isolé, qui est descendu en lui-même, qui s'est quelquefois déchiré afin de pouvoir faire vibrer la note véritable de la douleur.

Un livre—un bon livre—représente toujours quelque dévoûment secret, quelque douleur cachée, mais réelle. C'est le sentiment le plus intime d'une âme qui se dévoile et qui demande, qui mérite l'affection et le respect.

Oui, Messieurs, notre littérature, elle est bien à nous ; et nous avons droit d'en être fiers. C'est elle, en grande partie, qui nous a sauvés dans le passé ; c'est elle qui nous fera grands dans l'avenir.

Car, il ne faut pas l'oublier, c'est par ses lettres qu'on juge de la grandeur d'un peuple.

Comptez les nations dont le nom est resté inscrit dans l'histoire de l'humanité, et qui, encore aujourd'hui, éclairent de leurs lumières la marche du monde moderne. Toutes ont été des nations lettrées. Car les lettres et les arts sont la plus haute expression de la vraie civilisation.

Otez au peuple hébreu ses livres inspirés ; ôtez à l'Egypte ses savantes inscriptions ; enlevez à la Grèce et à Rome leurs poètes, leurs orateurs et leurs historiens, et que vous restera-t-il de ces nations renommées ? Un souvenir vague et confus, une image sans contours précis, comme celle que présentent les grands empires des Aztèques et des Incas dont les actions et la vie appartiennent plutôt à la mythologie qu'à l'histoire et sont plus propres à provoquer les élans de l'imagination et du rêve que les travaux de l'intelligence. Ce sont des peuplades dont la trace peu marquée se perd dans l'oubli.

Et pour parler des temps plus rapprochés de nous, parcourez l'histoire des diverses nations de l'Europe, et cherchez celles qui jettent sur le monde le plus brillant éclat ; vous verrez invariablement que ce sont celles qui ont eu des poètes, des historiens, des orateurs pour chanter et immortaliser leurs hauts-faits ; qui ont eu des sculpteurs, des peintres, des musiciens pour rehausser leur nom et l'inscrire sur tous les points du globe, dans les annales de l'humanité.

Et pour préciser davantage, comparez le règne de Louis XIV, le Roi-

Soleil, avec celui de Bonaparte, le grand empereur. Le premier de ces monarques a sans doute fait de grandes choses. La France, avec lui, a marché à la tête des nations de l'Europe et le poids de son épée entraînait presque toujours de son côté le plateau de la balance. Napoléon Ier, cependant, a été encore plus grand ; soutenu de son seul génie, il a mis l'Europe à ses pieds ; il a fait trembler, par le seul éclat de son nom redoutable, tout le monde civilisé ; et, sous son règne, la France a marché, non seulement à la tête de l'Europe, mais à la tête du monde entier. Il n'a fallu rien moins que les efforts réunis d'une ligue à peu près universelle, aidée de la trahison, pour renverser le colosse. Le premier a fait de grands drames, mais le second a produit une prodigieuse épopée. Et cependant, aujourd'hui, lequel des deux règnes jette le plus d'éclat ? N'est-ce pas celui de Louis XIV ? Ah ! Messieurs, c'est parce que l'un a eu toute une pléiade de grands écrivains qui l'ont immortalisé. C'est parce que les actions du roi se sont produites au milieu du grand rayonnement littéraire qui illuminait cette époque, et que chacun de ses actes, photographié, agrandi, en quelque sorte, à mesure qu'il se présentait, a été transmis à la postérité revêtu de cette espèce d'auréole que les lettres et les arts prêtent à tout ce qu'ils touchent, en dissimulant les défauts et en faisant ressortir les traits les plus favorables. Si les exploits de Napoléon avaient eu pour les peindre les génies qui ont illustré les actions de Louis XIV, ce règne impérial, malgré ses moments de faiblesse, formerait dans les annales du monde une époque éblouissante.

Remarquons, Messieurs, que je parle ici à un point de vue purement humain, et que je ne veux en aucune manière toucher à un ordre d'idées qui est tout à fait en dehors de ma compétence et sur lequel, du reste, je n'ai pas l'ambition de me prononcer. Mais n'avais-je pas raison de dire que les lettres et les arts sont le véritable critérium par lequel on juge de la civilisation et de la grandeur d'un peuple ?

Et si nous appliquons ce principe à notre existence nationale, ne trouvons-nous pas qu'il s'affirme, ici encore, dans toute sa vérité ?

Ouvrons notre histoire. Suivons la route ascendante que nous avons parcourue. N'est-ce pas lorsque l'instruction répandue — grâce aux foyers de lumière qui se sont allumés sur tout le pays — a commencé à nous faire connaître un peu en dehors de notre cercle, que nous avons compté dans l'univers ? Le commerce et l'industrie ont bien leur importance comme facteurs dans la production de la richesse et du bien-être d'une nation. Mais, est-ce qu'un seul livre ne fait pas plus pour signaler un peuple au dehors que toutes les opérations les plus savantes du commerce et de l'industrie ? Qu'est-ce qui a contribué, pendant cette dernière décade surtout, à faire revivre les relations qui nous rattachaient autrefois à la France ? N'est-ce pas le talent de nos littérateurs, de nos historiens ?

Nos livres n'ont-ils pas eu plus de retentissement et surtout plus de résultats pratiques, pour nous faire connaître à l'étranger, que tous les moyens de diffusion que nous avions employés jusqu'alors ?

Voilà encore ce qu'a fait notre humble littérature canadienne, ce qu'ont fait nos hommes de lettres canadiens. Souvenons-nous-en, Messieurs ; il est temps que, dans ce pays, cette classe si longtemps méconnue prenne enfin la place qui lui revient de droit. Il est temps qu'on réprime cet abus de positivisme qui a, pendant une si longue période, régné en souverain parmi nous. Nos hommes de lettres ne demandent qu'à travailler et à produire ; qu'on les mette au moins sur un pied d'égalité avec les autres classes sociales ; qu'on leur accorde le droit de naturalité. Jusqu'ici, ils ont disputé le terrain pied par pied ; ils ont conquis, par un long et rebutant travail, leur place au soleil, — pas tous, car les plus robustes seuls ont pu supporter les fatigues et les déceptions de la route. Cet état de choses doit cesser. Ce ne sont pas les hommes de talent qui font défaut ; tendons-leur la main et nous les verrons aussitôt se lever par centaines, et nous rendre en gloire l'appui moral que nous leur aurons prêté. Tâchons surtout d'établir parmi nous une saine et intelligente critique. Cessons de juger les talents littéraires au point de vue des partis politiques et de pratiquer l'éreintement ou l'apothéose selon que l'écrivain semble arborer telle couleur plutôt que telle autre. Cessons surtout de prêter une oreille complaisante aux diatribes des médiocrités qui veulent se venger de leur propre stérilité en jetant la boue et l'injure sur tout ce qui semble vouloir dépasser leur petite taille. Honorons les *hommes* et laissons les *fruits secs* dans leur ombre et leur légitime impuissance.

Je viens de dire que les talents ne nous font point défaut ; nous ne manquons pas, non plus, de sujets à traiter, en dehors des sphères de l'imagination. Notre histoire offre au talent sérieux une mine presque inépuisable. Nous pouvons le dire sans ostentation : pendant les quelques siècles qu'a duré notre existence nationale sur ce continent, nous avons accompli de grandes choses ; nous avons à notre crédit des actions que les plus fières nations du globe seraient fières de consigner dans leurs annales. Mais ces actions sont relativement inconnues. Pour qu'elles puissent briller au dehors dans tout leur éclat, il ne faut pas seulement qu'elles soient racontées par nos historiens, il faut qu'elles soient dramatisées, qu'elles soient chantées par nos poètes. Il faut qu'elles apparaissent aux regards de la foule dans cette auréole dont je parlais tout à l'heure, et qui est le seul cadre dans lequel il convient de les faire connaître à la postérité, pour l'honneur et la gloire de notre race.

Dieu merci, le travail est déjà commencé ; mais ce brillant début ne saurait nous satisfaire ; il faut qu'il ait une suite. Il faut terminer ce monument dont les premières pierres seules ont été posées. L'œuvre est là ; elle attend les ouvriers de bonne volonté, non pas de ces frelons qui émiettent les faits et bourdonnent autour d'une date insignifiante ou d'une pierre plus ou moins historique ; mais des travailleurs véritables et sérieux, chez qui l'art soit doublé d'une solide compétence ; que ceux-là se lèvent et se mettent résolument à l'ouvrage.

Mais, pour cela, il faut le concours de tous les sentiments. Il ne faut pas que ces ouvriers travaillent seuls dans le froid et dans l'ombre. Eclairons-les, réchauffons-les des rayons de notre ardente sympathie, et nous verrons alors leur travail s'illuminer d'un reflet nouveau et briller d'un éclat toujours grandissant. Réveillons-nous, si nous voulons que les autres se réveillent et agissent.

Nous avons donc, Messieurs, je l'ai dit déjà, une littérature canadienne ; elle est bien à nous ; nous ne l'avons dérobée nulle part : elle vient de notre cœur, elle fait partie de nous-mêmes. Mais, cette littérature, elle sort à peine de son enfance. Cependant, cette jeunesse est une précieuse qualité ; car, comme tout ce qui est jeune, elle est encore pure et saine ; elle n'a pas subi le souffle de la contamination. A vous surtout, les jeunes, — car c'est à vous que je m'adresse ici ; les anciens sont fatigués déjà par l'âge et le travail, — à vous de lui conserver ce caractère distinctif qui est peut-être, après tout, ce qu'elle a de plus canadien. A tous d'empêcher que, pour arriver à cette vogue qui donne, sinon la richesse, du moins le pain de chaque jour, elle ne soit forcée de se laisser glisser sur cette pente qui mène si vite à l'oubli de toute décence et de toute morale.

Nous avons des écrivains irréprochables, ou du moins qui tâchent de l'être dans la mesure de leurs forces ; aidons-les dans la lutte qu'ils ont à soutenir ; prêtons-leur notre assistance dans ce combat de chaque jour qui se présente pour eux plus terrible que nous ne pensons. Ils ne seront pas ingrats.

Eux qui se sont condamnés jusqu'à ce jour à travailler péniblement dans l'ombre et presque dans l'oubli, ils se remettront à l'œuvre avec un cœur nouveau, si nous ne leur refusons pas ce rayon bienfaisant que le soleil prodigue à la plus humble fleur, et qui est si nécessaire à leur épanouissement.

Plus tard, nous aurons raison, j'en suis convaincu, d'être fiers d'eux, comme nous sommes fiers, aujourd'hui, des héros dont ils feront connaître au monde entier les actions mémorables et les nobles vertus.

IV.—*Notice généalogique sur la maison d'Abbadie, de Maslacq,*

Par M. DE DUFAU DE MALUQUER, juge à Foix, département de l'Ariège, France.

(Communiquée par M. J.-Edmond Roy)

La maison d'Abbadie, de Maslacq [1], en Béarn, est fort ancienne et a formé, dans la seconde moitié du XVIe siècle et au XVIIe siècle, quatre branches connues sous les noms de *d'Abbadie d'Arboucave, d'Abbadie de Saint-Germain, d'Abbadie de Camou* et *d'Abbadie de Saint-Castin.*

Le *Dénombrement général des maisons de la vicomté de Béarn, dressé en 1385, par ordre de Gaston Phœbus,* mentionne l'*ostau* (maison) *de l'Abadie, domenger* (gentilhomme), à Maslacq [2].

Noble Jean DE CUQUERON, seigneur de Balansun et de l'abbaye de Maslacq, assista, le 22 octobre 1489, dans le château d'Audaux, au contrat de mariage de noble *en* Espagnolet d'Antin, seigneur d'Abos [3], avec noble damoiselle *na* Catherine d'Audaux [4].

Un procès-verbal dressé par M. de Laugar, conseiller du roi au Conseil souverain de Pau, le 15 mai 1513, porte que "le roy de Navarre avoit "permis au sieur d'Abbadie de batir l'eglise de Maslacq où il n'y en avoit "pour lors" [5].

La filiation des d'Abbadie, de Maslacq, est prouvée depuis Bertrand D'ABBADIE, Ier du nom, dont l'article suit.

I.

Abbés laïques de Maslacq, seigneurs de Baleix, de Castéide, de Lignac, de Tartoin et d'autres lieux, barons d'Arboucave [6].

I. — *Egregy* M. Me Bertrand D'ABBADIE, Ier du nom, abbé laïque de Maslacq, était avocat général du roi de Navarre, lorsqu'il vendit, le 25 novembre 1529, par le moyen de Bernard-Guilhem d'Abbadie, de Maslacq,

[1] *Maslacq*, commune du canton de Lagor, arrondissement d'Orthez.

[2] Paul Raymond, *Inventaire sommaire des archives des Basses-Pyrénées*, tome VI, IIe partie, page 3.

[3] *Cuqueron*, *Abos*, communes du canton de Monein, arrondissement d'Oloron ; — *Balansun*, commune du canton et de l'arrondissement d'Orthez ; — *Audaux*, commune du canton de Navarrenx, arrondissement d'Orthez.

[4] Archives des Basses-Pyrénées, E. 1605, f° 71, v°.

[5] Bibliothèque Nationale, *Carrés de d'Hozier*, volume Ier, dossier ABADIE, f° 41, v°.

[6] *Baleix*, commune du canton de Montaner, arrondissement de Pau ;— *Castéide-Cami*, commune du canton d'Arthez, arrondissement d'Orthez ; — *Lignac*, hameau, commune de Castéide-Cami ; — *Tartoin*, fief, commune de la Bastide-Monréjau, canton d'Arthez ; — *Arboucave*, commune du canton de Geaune, arrondissement de Saint-Sever (Landes).

son frère, une pièce de terre, située à Castetnau [1], en faveur de mossen Arnaud de Bonnefont, de cette commune, curé de Camblong [2]. Il épousa, suivant contrat retenu à Gouze, le 9 novembre 1531, par Me Menaud de Maucor, notaire ordinaire de la Cour de Mgr le sénéchal de Béarn et notaire de Castétis [3], damoiselle Jeanne DE FLORENCE, fille et héritière d'honorable homme Peyrolet DE FLORENCE, seigneur d'Osse, d'Aydius, de Lées-Athas [4] et de Baleix, jurat et marchand d'Oloron, et d'honnête dame Marie DE CUYALAR. En faveur de ce mariage, Peyrolet de Florence constitua en dot à sa fille, notamment, la seigneurie de Baleix qu'il avait acquise, pour le prix de 1,285 écus, de noble Pierre, seigneur et baron de Gayrosse [5], et la maison de Médevila, située à Oloron, qu'il avait achetée, pour le prix de 210 écus, de Michel de Médevila, marchand, de cette ville [6]. Bertrand d'Abbadie rendit hommage, le 27 janvier 1538, dans le palais épiscopal de Lescar, à Jacques de Foix, évêque de Lescar, lieutenant-général du roi, pour la seigneurie de Baleix et l'abbaye de Maslacq [7]. Le 23 octobre 1541, à Denguin, agissant avec le consentement d'honorable homme Peyrolet de Florence, bourgeois et marchand d'Oloron, son beau-père, il donna en échange à honorable homme Me Pés de Castagnède, syndic de Béarn, habitant à Pau, la seigneurie de Baleix, et reçut en contre-échange, moyennant une soulte de 350 écus, les seigneuries d'Herm, d'Orius [8], de Lignac et de Tartoin et le droit de rachat de l'abbaye et de la dîme d'Herm, aliénées aux abbé et trésoriers de la confrérie du Saint-Esprit, de la ville d'Arthez [9], Bertrand d'Abbadie fut reconnu *voisin* (bourgeois) par les *voisins* d'Osse, le 1er avril 1547 [10]. Premier président de la Chambre des Comptes de Pau, par provisions du 20 octobre 1550, en remplacement de Mathieu du Pac [11],

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[1] *Castetnau, Camblong*, aujourd'hui commune de Castetnau-Camblong, canton de Navarrenx, arrondissement d'Orthez.

[2] Archives des Basses-Pyrénées, E. 1614, f° 237. Voir, aussi, E. 1615, 1616, 1619.

[3] *Gouze*, commune du canton de Lagor, arrondissement d'Orthez ; — *Castétis*, commune du canton et de l'arrondissement d'Orthez.

[4] Le 22 janvier 1538, à Lescar, honorable homme le seigneur Peyrolet de Florence, jurat et marchand d'Oloron, rendit hommage à Jacques de Foix, évêque de Lescar, lieutenant-général, pour l'abbaye laïque d'Osse, en Aspe (Archives des Basses-Pyrénées, E. 1982 ; E. 1996, f° 60, et B. 848, f° 33). — *Osse, Aydius, Lées-Athas*, communes du canton d'Accous, arrondissement d'Oloron.

[5] *Gayrosse*, fief, commune d'Audéjos, canton d'Arthez, arrondissement d'Orthez.

[6] Archives des Basses-Pyrénées, E. 1775, f° 84, v° ; — *Nouvelles acquisitions*, Notaires de La Bastide-Monréjau, n° 33, f° 46, v°.

[7] Archives des Basses-Pyrénées, B. 848, f° 41, v° ; — Bibliothèque Nationale, *Collection Chérin*, volume Ier, dossier D'ABADIE, en Béarn, n° 1, f° 8 ; — *Carrés de d'Hozier*, volume Ier, dossier ABADIE, f° 3.

[8] *Denguin*, commune du canton de Lescar, arrondissement de Pau ; — *Herm, Orius*, hameaux, commune d'Audéjos, canton d'Arthez, arrondissement d'Orthez.

[9] Archives des Basses-Pyrénées, *Nouvelles acquisitions*, Notaires de la Bastide-Monréjau, n° 33, fos 46, v° et 49.

[10] Archives des Basses-Pyrénées, E. 1805, f° 897, v°.

[11] *Extraits des registres du Conseil souverain, du parlement et de la Chambre des Comptes de Pau*, 1547-1691, pages 155, 166 et 178 (Bibliothèque de M. l'abbé Dubarat); —*Bulletin de la Société des sciences, lettres et arts de Pau*, IIe série, 1871-1872, page 62.

il était aussi conseiller et maître des requêtes du roi, lorsqu'il rendit hommage à Jacques de Foix, évêque de Lescar, dans la ville d'Arthez, le 4 mars 1551, pour les seigneuries de Castéide, Lignac, Tartoin et autres lieux nobles qu'il possédait en Béarn[1]. Reçu *voisin* (bourgeois) de la ville de Pau, le 20 avril 1552[2], mentionné comme conseiller au Conseil souverain de Pau et maître des requêtes, les 16 août 1552 et 15 janvier 1555[3], il fit donation, le 18 juin 1561, des revenus du moulin de Meyrac, situé dans la vallée d'Aspe[4], que feu Me Bernard-Guilhem d'Abbadie, son frère, avait acheté de M. de Sainte-Colomme, en faveur de Me Arnaud Carsusan, bachelier en droit, recteur d'Arance[5], en reconnaissance des services que celui-ci lui avait rendus en dirigeant, pendant dix années, l'éducation de trois de ses fils, Jean, Pierre et Gassiot d'Abbadie, à Paris, Toulouse et dans d'autres villes du royaume[6]. Bertrand d'Abbadie racheta, le 21 juin 1561, conjointement avec sa femme, la seigneurie de Baleix, pour le prix de 310 écus, des mains de Me Jean de Castagnède, fils et héritier de feu Me Pés de Castagnède, syndic de Béarn[7]. Il est qualifié " egregi M. " Me Bertrand d'Abbadie, conseiller ordinaire et maître des requêtes des " roi et reine, seigneurs souverains de Béarn, président en leur Conseil " ordinaire et en la Chambre des Comptes de leurs finances", dans son testament, en date à Maslacq, dans la maison abbatiale, du 6 août 1561. Il demande, dans cet acte, à être enterré dans l'église paroissiale de Maslacq et déclare avoir de Jeanne de Florence, sa femme, sept fils et trois filles, nommés : Jean, Pés, Gassiot, Pascal, Jean-Pierre, Arnaud et Jean-Jacques ; Isabelle, Marguerite et Catherine. Ses deux premières filles sont mariées. Il institue pour héritier universel, Jean, son fils aîné, et lègue à chacun de ses autres fils 300 écus petits. Il veut que mossen Jean d'Abbadie, son frère, soit nourri et entretenu dans sa maison ; lègue aux pauvres 100 francs, et nomme pour exécuteurs testamentaires Mes Jean de Bordenave et Guilhelm de la Vigne, conseillers des roi et reine, mossen François de Pinsun, archiprêtre de Maslacq et vicaire général de l'évêque de Dax à Orthez, et Me Menaud de Maucor, secrétaire du roi[8]. Bertrand d'Abbadie vendit, le 24 novembre 1562, en sa qualité d'héritier sous bénéfice d'inventaire de Me Bernard-Guilhem d'Abbadie, son frère, le champ de la Teulère, situé à Lescar, en faveur de Guilhamolo d'Amade, marchand, de cette ville[9], et mourut, avant le 16 septembre 1567, date à laquelle

[1] Archives des Basses-Pyrénées, B. 848, fo 105.

[2] Archives de Pau, BB. 1, fo 10, vo.

[3] *Extraits des registres du Conseil souverain, du parlement et de la Chambre des Comptes de Pau*, pages 2 et 4 (Bibliothèque de M. l'abbé Dubarat).

[4] *Meyrac*, village, commune de Sévignac, aujourd'hui, *Sévignac-Meyrac*, canton d'Arudy, arrondissement d'Oloron.

[5] *Arance*, commune du canton de Lagor, arrondissement d'Orthez.

[6] Archives des Basses-Pyrénées, E. 1996, fo 59.

[7] Archives des Basses-Pyrénées, E. 1996, fo 60.

[8] Bibliothèque Nationale, *Carrés de d'Hozier*, volume Ier, dossier ABADIE, fo 10.

[9] Archives des Basses-Pyrénées, E. 1997, fo 233.

Guillaume d'Areau fut pourvu de son office de président en la Chambre des Comptes [1]. — On a vu qu'il avait eu de Jeanne de Florence :

1° Jean D'ABBADIE. — Il fut docteur en droit, avocat au Conseil souverain de Pau et seigneur de la maison abbatiale de Maslacq, et vendit, le 24 mai 1571, pour le prix de 1,200 livres tournois, en faveur de M. Charles du Pont, conseiller de la reine de Navarre en son conseil ordinaire, la maison appelée " la maison neuve du président Abbadie ", située à Pau, dans la rue de Castetmenor [2]. Jean d'Abbadie épousa damoiselle Gratianne DE MARCA, fille d'*egregy* Jérôme DE MARCA, président en la chambre criminelle du Conseil souverain de Pau, et de damoiselle Arnaudine D'ARRAC [3], donna quittance de la dot de sa femme, le 27 mars 1573, et fit son testament à Gan [4] le 10 juillet suivant. Il institua pour son héritier son fils Gratian, qui mourut jeune. — Gratianne de Marca, veuve de Jean d'Abbadie, transigea, le 17 mai 1586, avec noble Gratian d'Abbadie, son beau-frère, et épousa, en secondes noces, le 21 août 1590, Me Jean de Bordenave, secrétaire du roi à la Chambre des Comptes de Pau [5] ;

2° Pés ou Pierre D'ABBADIE, docteur en droit, abbé de Pimbo [6], qui devint héritier de la maison abbatiale de Maslacq. Il épousa, avant le 17 mai 1580, damoiselle Suzanne DE GAYON, fille de noble Gabriel DE GAYON, seigneur de Gayon [7], et de damoiselle Magdeleine DE BÉARN [8], et mourut sans postérité, avant le 28 décembre 1583 ;

3° Gassiot, *alias* Gratian D'ABBADIE, Ier du nom, dont l'article suit ;

4° Pascal D'ABBADIE, qui forma la branche des seigneurs de Camou, de Salies, rapportée au chapitre III ;

5° Jean-Pierre D'ABBADIE, auteur de la branche des seigneurs et barons de Saint-Castin, rapportée au chapitre IV ;

6° Arnaud D'ABBADIE ;

7° Jean-Jacques D'ABBADIE ;

8° Isabelle D'ABBADIE, qui contracta mariage, avant le 6 août 1561, avec Bernard DE LARTET, d'Orthez, dont elle eut :

a. Pierre DE LARTET ;

b. Et Catherine DE LARTET, qui épousa, vers 1593, noble Jacques DE MARCA, de Gan, qui fut créé vice-sénéchal de Navarre et Béarn en 1620 [9]. De cette alliance naquit à Gan, le 24 janvier 1594, le célèbre historien de Béarn, Pierre DE MARCA, président au parlement de Navarre, archevêque de Paris [10] ;

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[1] *Extraits des registres du Conseil souverain, du parlement et de la Chambre des Comptes de Pau*, page 178 (Bibliothèque de M. l'abbé Dubarat) ; — *Bulletin de la Société des sciences, lettres et arts de Pau*, IIe série, 1871-1872, page 131.

[2] Archives des Basses-Pyrénées, E. 2001, fo 73, vo.

[3] Pierre de Marca, *Histoire de Béarn*, nouvelle édition, par M. l'abbé Dubarat ; Pau, Garet, 1894, tome Ier, pages xii, xiii et xiv.

[4] *Gan*, petite ville du canton de Pau (ouest) et de l'arrondissement de Pau.

[5] Archives des Basses-Pyrénées, E. 2132, fo 289, vo et 309, vo ; E. 2006, fo 134, et E. 2007, fo 627.

[6] *Pimbo*, commune du canton de Geaune, arrondissement de Saint-Sever (Landes).

[7] *Gayon*, commune du canton de Lembeye, arrondissement de Pau.

[8] Archives des Basses-Pyrénées, E. 2138, fo 227, vo.

[9] Pierre de Marca, *Antiquités du Béarn*, Pau, Vignancour, 1846, page 25.

[10] Pierre de Marca, *Histoire de Béarn*, nouvelle édition, pages xiv et cclxxiii.

9° Marguerite D'ABBADIE, mariée, en premières noces, avant le 6 août 1561, à noble Gratian DE SAUT, seigneur de Castillon,[1] qui fit son testament à Oloron, le 14 décembre 1567. Il déclare, dans cet acte que sa femme ayant eu, comme lui, la grâce d'embrasser la religion réformée, il veut qu'elle épouse un protestant si elle se remarie; et " d'autant que ladite Marguerite d'Abbadie pourrait être induite et " séduite par ses parents et autres adhérents à la religion du pape, à abandonner la " religion réformée et à revenir à celle du pape, ou bien à se marier avec un catho- " lique, de telle façon que les enfants du testateur pourraient être, par suite, infec- " tés (*sic*) de cette dernière religion, il la prive, dans ces cas, d'un legs de 1,700 livres " qu'il lui fait . . . "[2]. — Gratian de Saut mourut avant le 14 mai 1568, et Marguerite d'Abbadie épousa, en secondes noces, avant le 11 juin 1574, le seigneur Gratian DE LANE, bourgeois et marchand d'Oloron, d'abord seigneur de Lalongue, puis abbé laïque de Lescun[3]. — Marguerite d'Abbadie eut de son premier mari :

a. Marguerite DE SAUT, qui épousa à Oloron, le 9 avril 1573, noble Jean-Bertrand DE SALLES, gouverneur de la ville de Navarrenx, fils aîné de noble Arnaud DE GACHISSANS, seigneur de Salles, aussi gouverneur de Navarrenx. Elle mourut sans postérité, avant le 20 janvier 1582[4];

b. Marie DE SAUT, décédée jeune :

c. Jeanne DE SAUT, qui contracta mariage, le 27 novembre 1580, à Maslacq, avec noble André DE SALLES, seigneur de Marsôo, fils cadet de noble Arnaud DE GACHISSANS, seigneur de Salles, gouverneur de la ville de Navarrenx. Elle mourut sans postérité, avant le 6 août 1582[5];

d. Et Catherine DE SAUT, fille posthume, dame de Castillon, mariée à Oloron, le 31 juillet 1583, à noble Jean DE MÉRITEIN, seigneur de Méritein, seigneur souverain de Nabas et de Bisqueis, viguier de Mongaston[6];

10° Et Catherine D'ABBADIE, mariée, avant le 7 mars 1573, à noble Pierre D'ARRAC, capitaine, de la ville de Gan, qui donna quittance, le 13 juin 1574, à Maslacq, de la dot de 1,200 tournois constituée à sa femme[7].

II. — Noble Gassiot, *alias* Gratian D'ABBADIE, Ier du nom, docteur en droit, lieutenant-général en la sénéchaussée des Lannes, au siège de Saint-Sever[8], le 30 mai 1581, est dit héritier de la maison abbatiale de Maslacq, dans un acte du 28 décembre 1583[9]. Il s'engagea, le 10 mars 1585, envers honorables Augustin de la Salle, François de Casenave, André d'Augaro et Arnaud de Crideboup, jurats de Sarpourenx[10], à alimenter d'eau le moulin

[1] *Castillon*, commune du canton d'Arthez, arrondissement d'Orthez.

[2] Archives des Basses-Pyrénées, E. 1782, fos 168, 294 et 348, vo.

[3] Archives des Basses-Pyrénées, E. 1784, fo 69; E. 1706, fo 21. — *Lalongue*, commune du canton de Lembeye, arrondissement de Pau.

[4] Archives des Basses-Pyrénées, E. 1783, fo 160; E. 1796, fo 156. — *Salles*, aujourd'hui *Salles-Mongiscard*, commune du canton de Salies, arrondissement d'Orthez.

[5] Archives des Basses-Pyrénées, E. 1238, fo 284, vo; E. 1789, fo 156. — *Marsôo*, fief, commune de Saint-Boès, arrondissement d'Orthez.

[6] Archives des Basses-Pyrénées, E. 1789, fos 264, vo et 525, vo. — *Méritein*, *Nabas*, communes du canton de Navarrenx, arrondissement d'Orthez; *Bisqueis*, hameau, commune de Charre, canton de Navarrenx.

[7] Archives des Basses-Pyrénées, E. 2132, fo 286, vo. — *Nouvelles acquisitions*, actes de Raymond de Coayreforcq, notaire de Larbaig, registre in-4°, 179 feuillets, fo 84.

[8] *Saint-Sever*, chef-lieu d'arrondissement (Landes).

[9] Archives des Basses-Pyrénées, E. 1239, fo 50.

[10] *Sarpourenx*, commune du canton de Lagor, arrondissement d'Orthez.

de cette commune,[1] et fit son testament, à Saint-Sever, le 13 avril 1595 [2]. Il avait épousé : 1° Bertrande DE LA LANNE, damoiselle, héritière de l'abbaye séculière et maison abbatiale de Mant, d'Arboucave et de Monget [3] ; 2° Saubade DE BELSUNCE, damoiselle. — Du premier lit vinrent :

1° Pierre D'ABBADIE, Ier du nom, dont l'article suit ;

2° Jeanne D'ABBADIE, qui épousa, à Saint-Sever, le 15 juin 1593, M. Me Daniel DE BARRY, qui devint conseiller du roi, lieutenant-général au siège de Saint-Sever ;[4]

Gratian d'Abbadie eut de Saubade de Belsunce :

3° Gratian D'ABBADIE, IIe du nom, qui fut la tige des seigneurs de Saint-Germain, rapportés au chapitre II ;

4° Daniel D'ABBADIE ;

5° Et Catherine D'ABBADIE, mariée, suivant contrat du 10 décembre 1607, à noble Armand DE DENGUIN, seigneur de Denguin, de Vignoles d'Aussevielle et de Bougarber, en sa partie [5]. Elle fit son testament à Denguin, le 17 juillet 1610 [6]. Armand de Denguin testa, le 23 juillet 1620, et laissa de son mariage : Jeanne DE DENGUIN, qui épousa, le 3 septembre 1635, noble Antoine DE SALETTES.[7]

III.—Noble Pierre D'ABBADIE, Ier du nom, écuyer, seigneur de Baleix, épousa, le 13 août 1601, à Oloron, damoiselle Gratie DE COLOMIÈS, fille d'*egregy* Me Bernard DU COLOMER ou DE COLOMIÈS, conseiller du roi, et de damoiselle Gratie DE GASSION, dame de Goès.[8] Il est qualifié " noble " Pierre d'Abbadie, de Maslacq, seigneur et baron d'Arboucave et Baleix, " abbé de Mant ", dans un acte du 16 juin 1605, par lequel il vendit, pour le prix de 15,500 francs, de 10 sols bons par franc, la maison abbatiale et ses dépendances, appelées l'abbaye de Gayrosse, située à Osse, dans la vallée d'Aspe, en faveur de Guilhem-Arnaud de Castarranh et de Bertrand de Davancentz, son gendre, marchands, d'Oloron.[9] Il vendit, encore, le 11 juillet 1605, la seigneurie de Baleix à Philippe de Saint-Cricq, pour le prix de 6,000 francs,[10] et laissa postérité de son mariage.

V.—Noble Pierre D'ABBADIE, IIe du nom, baron d'Arboucave,—petit-fils de noble Pierre D'ABBADIE, Ier du nom, seigneur de Baleix et baron

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[1] Archives des Basses-Pyrénées, E. 1239, fo 227.

[3] Bibliothèque Nationale, *Carrés de d'Hozier*, volume Ier, dossier ABADIE, 1o 13.

[3] *Mant*, *Monget*, communes du canton d'Hagetmau, arrondissement de Saint-Sever, (Landes).

[4] Baron de Cauna, *Armorial des Landes*, Paris, Dumoulin, 1869, tome III, page 59.

[5] J.-B.-E. de Jourgain, *Nobiliaire de Béarn*, Paris, Charles Blot, 1879, tome Ier page 158, note.—*Denguin*, *Aussevielle*, *Bougarber*, communes du canton de Lescar, arrondissement de Pau ;—*Vignolles*, hameau, commune de Denguin.

[6] Archives des Basses-Pyrénées, *Nouvelles acquisitions*, Notaires de la Bastide-Monréjau, n° 112, fo 143.

[7] Dufau de Maluquer, *Armorial de Béarn*, tome II, page 131.

[8] Bibliothèque Nationale, *Carrés de d'Hozier*, volume Ier, dossier ABADIE, fo 17;—archives des Basses-Pyrénées, E. 1805, fo 519.

[9] Archives des Basses-Pyrénées, E. 1805, fo 897, vo.

[10] Archives des Basses-Pyrénées, E. 2024, fo 901, vo ;—*Nouvelles acquisitions*, actes de Raymond de Cazalet, notaire de Larbaig, 1605-1608, registre in-4°, 119 feuillets papier, fo 5.

d'Arboucave, et de damoiselle Gratie DE COLOMIÈS, est blasonné d'office n° 272 de l'*Armorial de Béarn*, de 1696-1701.—Dame Marie D'ESPALUNGUE, sa femme, eut son blason enregistré dans le même recueil, le 17 juin 1701.[1]

Noble Henry D'ABBADIE D'ARBOUCAVE, l'un de leurs fils, fut reçu chevalier de l'ordre de Saint-Jean de Jérusalem, le 17 juillet 1703.[2]

Messire Bernard D'ABBADIE D'ARBOUCAVE, évêque de Dax, de 1690 à 1733, frère de Noble Pierre D'ABBADIE, baron d'Arboucave, Ier du nom, fit enregistrer son blason dans l'*Armorial de Dax*, le 10 février 1702.[3]

VIII.—Messire François D'ABBADIE, baron d'Arboucave, chef d'escadrons de carabiniers, chevalier de Saint-Louis, dernier représentant mâle de cette branche,—arrière petit-fils de noble Pierre D'ABBADIE, Ier du nom, baron d'Arboucave, et de dame Marie D'ESPALUNGUE, épousa dame Marie DE GOMBAUD-ROLIE, de Bordeaux, et en eut :

1° Pierre-Charles D'ABBADIE D'ARBOUCAVE, soldat dans le dixième bataillon du Bec d'Ambès, décédé à Pau, le 3 ventôse an III (21 février 1795), à l'âge de 19 ans ;

2° Angélique-Magdelaine D'ABBADIE D'ARBOUCAVE, décédée à Pau, à l'âge de 19 ans, le Ier jour complémentaire an IV (17 septembre 1796) ;

3° Et Magdelaine-Angélique-Justine D'ABBADIE D'ARBOUCAVE, dont l'article suit.

IX. Magdelaine-Angélique-Justine D'ABBADIE D'ARBOUCAVE, née à Maslacq, le 4 octobre 1781, épousa à Pau, le 7 fructidor an XI (25 août 1803), Clair-Joseph DE BARBOTAN, IIe du nom, comte de Barbotan, né à Saint-Sever, le 24 juillet 1771, fils de Jean-Marie DE BARBOTAN, chevalier, comte de Barbotan, seigneur de Mormès[4] et d'autres places, mousquetaire de la garde du roi, et de dame Marie-Angélique DE NOÉ, et petit-fils de Clair-Joseph DE BARBOTAN, Ier du nom, chevalier, comte de Barbotan, maréchal de camp, député de la noblesse de la sénéchaussée de Dax aux Etats Généraux de 1789, mort sur l'échafaud révolutionnaire, à Paris, le 31 mars 1794, et de dame Marie-Anne DARCET.[5]—Magdelaine-Angélique-Justine d'Abbadie d'Arboucave mourut à Pau, le 30 août 1836, à l'âge de 54 ans, après avoir eu de son mariage :

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[1] *Bulletin de la Société héraldique et généalogique de France*, Paris, 1879, colonne 605 ; Dufau de Maluquer et Jourgain, *Armorial de Béarn*, tome Ier, page 284.

[2] Bibliothèque Nationale, *Carrés de d'Hozier*, volume Ier, dossier ABADIE, fos 42 et 43 ; — Louis de la Roque, *Catalogue des chevaliers de Malte*, Paris, Desaide, 1891, colonne 1.

[3] *Revue de Béarn, Navarre et Lannes*, 1884, pages 94 et 220 ;—Dufau de Maluquer, *Armorial de Béarn*, tome III, page 50.

[4] *Barbotan*, commune de Cazaubon, chef-lieu de canton de l'arrondissement de Condour (Gers) ;—*Mormès*, commune du canton de Nogaro, arrondissement de Condour (Gers).

[5] Baron de Cauna, *Armorial des Landes*, tome III, pages 55 et 56 ;—*Revue de Gascogne*, 1889, page 389.

1° Louis, comte DE BARBOTAN, décédé sans postérité de son mariage avec dame Mathilde DE NAVAILLES-BANOS.—La comtesse de Barbotan réside au château de Maslacq ;

2° *Charles*-Marc-Antoine DE BARBOTAN, dont l'article suit ;

3° Antoinette-*Gabrielle*-Angélique DE BARBOTAN, née à Pau, le 6 juillet 1812, mariée au comte DE MAULÉON ;

4° Et Françoise-Magdeleine-*Mathilde* DE BARBOTAN, née aussi à Pau, le 6 juillet 1812.

X. *Charles*-Marc-Antoine, comte DE BARBOTAN,, né à Pau, le 14 mars 1816, est décédé à Barbotan (Gers), le 7 septembre 1869, conseiller général des Basses-Pyrénées, chevalier de la légion d'honneur, après avoir eu de son mariage, contracté à Pau, le 24 avril 1849, avec Anna-Pierre-*Louise* DE DUFAU, fille de M. Jean-Louis DE DUFAU, premier président honoraire de la Cour d'appel de Pau, ancien député des Basses-Pyrénées, ancien maire de la ville de Pau, officier de la légion d'honneur, et de Mme Jeanne FILHOS :

1° *Marguerite*-Marie-Mathilde-Jeanne-Gabrielle DE BARBOTAN, dont l'article suit ;

2° Louise-Marie-Françoise-Gabrielle DE BARBOTAN, née à Pau, le 12 novembre 1851, décédée dans cette ville, le 10 juin 1853 ;

3° Marie-Mathilde-Paule-*Jeanne* DE BARBOTAN, née à Pau, le 25 décembre 1852, mariée dans cette ville, le 2 février 1875, à Charles-Henri-*Aymar*, vicomte d'ADHÉMAR DE CRANSAC, chef de bataillon d'infanterie, chevalier de la légion d'honneur.—De cette union :

a. Gabrielle D'ADHÉMAR DE CRANSAC ;

b. Et Jeanne D'ADHÉMAR DE CRANSAC ;

4° Fanny-Marie-Madelaine-*Henriette* DE BARBOTAN, née à Pau, le 22 juillet 1854, mariée dans cette ville, le 5 février 1873, à Jean-*Armand*, comte DE BARRANTE, décédée à Paris, le 24 juillet 1884.—De cette alliance :

Henry-Louis-Marc-Antoine-*Armand* DE BARRANTE, né à Pau, le 8 mars 1875.

5° Et Alphonsine-Angélique-Marie-Justine-Coralie DE BARBOTAN, née à Pau, le 31 juillet 1856, décédée dans cette ville, le 15 juin 1858.

XI. *Marguerite*-Marie-Mathilde-Jeanne-Gabrielle DE BARBOTAN, née à Pau, le 21 avril 1850, représente aujourd'hui les d'Abbadie d'Arboucave, du chef de sa grand'mère paternelle. Elle a épousé à Pau, le 10 juin 1872, Jean-Dominique-*Albert*, baron DE BASTARD, dont elle a eu :

1° Louis-Henri-*Alfred* DE BASTARD, né à Pau, le 4 septembre 1874 ;

2° Jean-Melchior-*Robert* DE BASTARD, né à Pau, le 5 novembre 1876 ;

3° Une fille, morte en naissant ;

4° Et Marie-Jeanne-*Marguerite* DE BASTARD, née à Pau, le 20 juillet 1881.

II

Seigneurs de Saint-Germain.

III. Noble Gratian D'ABBADIE, IIe du nom,—fils de noble Gassiot, *alias* Gratian D'ABBADIE, Ier du nom, lieutenant-général en la sénéchaussée des Lannes, au siège de Saint-Sever, et de dame Saubade DE

BELSUNCE sa seconde femme,—épousa dans la maison noble de Patience, à Saint-Aubin[1], le 9 novembre 1622, damoiselle Roquette DE MESMES, fille de noble Isaac DE MESMES, seigneur de Patience, et de damoiselle Eléonore DE MARSAN. En faveur de ce mariage, Gratian d'Abbadie reçut la donation qui lui fut faite par sa mère de la seigneurie de Saint-Germain[2], de la dîme d'Arboucave et d'une somme de 6,000 livres.[3]—De cette union vint Isaac d'Abbadie, dont l'article suit.

IV.—Noble Isaac D'ABBADIE, seigneur de Saint-Germain, contracta mariage, à Saint-Sever, le 16 juillet 1652, avec damoiselle Marie-Claude D'ARMAIGNAC, fille de noble Hector D'ARMAIGNAC, sieur de Labeyrie[4], et de damoiselle Catherine DE BOEIL.[5] Il fit son testament dans la maison de Labeyrie, paroisse de Saint-Aubin, le 12 avril 1681, et laissa plusieurs enfants de son mariage.[6]

Les d'Abbadie de Saint-Germain étaient représentés, en 1752, par messire Bertrand D'ABBADIE DE SAINT-GERMAIN, seigneur de Saint-Germain et de Labeyrie, ancien lieutenant des vaisseaux du roi, chevalier de l'ordre militaire de Saint-Louis.[7]

III

Seigneurs de Camou, de Salies.

II.—Noble Pascal D'ABBADIE,—quatrième fils d'*egregy* M. Me Bertrand D'ABBADIE, Ier du nom, abbé laïque de Maslacq, seigneur de Baleix, de Lignac, de Tartoin et d'autres lieux, et de damoiselle Jeanne DE FLORENCE,—épousa, le 6 mars 1575, dans le temple protestant de Salies, damoiselle Anne DE SAINT-MARTIN,[8] dame de Camou[9], et reçut, le 29 décembre 1579, la donation que lui fit sa mère de la quarte des bien avitins qu'elle possédait à Oloron.[10]—Anne de Saint-Martin épousa, en secondes noces, avant le 1er octobre 1598, *egregi* Me Jean DE FREXO, conseiller du roi.[11]—Elle eut de Pascal d'Abbadie :

1° Jean D'ABBADIE, dont l'article suit;

2° Et Pierre D'ABBADIE, baptisé dans le temple protestant de Salies, le 25 janvier 1581.[12]

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[1] *Saint-Aubin*, commune du canton de Mugron, arrondissement de Saint-Sever.

[2] *Saint-Germain*, fief, commune d'Arboucave.

[3] Bibliothèque Nationale, *Carrés de d'Hozier*, volume Ier, dossier ABADIE, f° 52.

[4] *Labeyrie*, fief, commune de Saint-Aubin.

[5] Bibliothèque Nationale, *Carrés de d'Hozier*, volume Ier, dossier ABADIE, f° 55.

[6] Bibliothèque Nationale, *Carrés de d'Hozier*, volume Ier, dossier ABADIE, f° 58.

[7] Bibliothèque Nationale, *Carrés de d'Hozier*, volume Ier, dossier ABADIE, f° 82.

[8] Archives de Salies, *Etat civil protestant*, GG. 15, f° 607.

[9] *Camou*, fief, commune de Salies, arrondissement d'Orthez.

[10] Archives des Basses-Pyrénées, E. 1238, f° 168, v°, et E. 1239, f° 49, v°.

[11] Archives des Basses-Pyrénées, E. 2016, f° 204.

[12] Archives de Salies, *Etat civil protestant*, GG. 15, f° 596, v°.

III.—Noble Jean D'ABBADIE fut baptisé dans le temple protestant de Salies, le 5 octobre 1578.[1] Il testa à Pau, le 1er octobre 1598, étant sur le point de partir pour Bordeaux, à l'effet d'y continuer ses études.[2] Avocat, il fut pourvu, le 24 février 1607, de la charge de procureur patrimonial et contrôleur en la Chambre des Comptes de Pau.[3] Il est qualifié "conseiller du roi, procureur général de la Chambre des Comptes de Pau," dans son testament, daté de cette ville, 12 août 1627.[4]—De son mariage avec damoiselle Corisande DE LACOSTE vinrent :

1° Isaac D'ABBADIE, dont l'article suit :
2° Et Jean D'ABBADIE.

IV.—Noble Isaac D'ABBADIE, avocat au parlement de Navarre, fut admis aux Etats de Béarn, en 1649, comme seigneur de Camou, de Salies,[5] et contracta mariage à Pau, le 12 janvier 1656, avec damoiselle Marie D'ABBADIE DE LIVRON D'ESPALUNGUE, fille de M. Me Raymond D'ABBADIE DE LIVRON, conseiller au parlement de Navarre, et de dame Anne DE RAGUE D'ESPALUNGUE.[6] Il acquit, le 12 mars, 1659, pour le prix de 42,000 livres, l'office de conseiller au parlement de Navarre qu'avait exercé son beau-père,[7] et mourut avant le 8 juin 1676, après avoir eu de son alliance :

1° Jean D'ABBADIE, né au mois de septembre 1657, baptisé dans l'église Saint-Martin de Pau, le 2 novembre 1659.[8] Il fut admis aux Etats de Béarn, en 1676, comme seigneur de Camou, de Salies, et héritier de son père ;[9]
2° Isaac D'ABBADIE, baptisé dans l'église Saint-Martin de Pau, le 21 février 1667 ;[10]
3° Et Marie-Isabeau D'ABBADIE, dont l'article suit.

V.—Marie-Isabeau D'ABBADIE-CAMOU épousa noble Pierre DE BORDES, qui fut admis aux Etats de Béarn, le 14 juin 1697, comme seigneur de la maison noble d'Abbadie de Camou (*sic*), de Salies.[11]

IV

Seigneurs et barons de Saint-Castin.

II.—*Egregy* noble Jean-Pierre D'ABBADIE, du lieu de Maslacq, docteur en droit,—cinquième fils d'*egregy* M. Me Bertrand D'ABBADIE, Ier du nom,

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1 Archives de Salies, *Etat civil protestant*, GG. 15, fo 585.
2 Archives des Basses-Pyrénées, E. 2016, fo 204.
3 *Bulletin de la Société des sciences, lettres et arts de Pau*, IIe série, 1885-1886, page 152.
4 Archives des Basses-Pyrénées, E. 2033, fo 140.
5 Archives des Basses-Pyrénées, C. 718.
6 Archives des Basses-Pyrénées, E. 2045, fo 1.
7 Dufau de Maluquer, *Armorial de Béarn*, tome Ier, page 341, note 4.
8 Archives de Pau, *Etat civil*, GG. 2, fo 85.
9 Archives des Basses-Pyrénées, C. 735, fo 62, vo.
10 Archives de Pau, *Etat civil*, GG. 2, fo 85.
11 Archives des Basses-Pyrénées, C. 745 fo 33.

abbé laïque de Maslacq, seigneur de Baleix, de Lignac, de Tartoin et d'autres lieux, et de damoiselle Jeanne DE FLORENCE,—était conseiller et maître des requêtes de l'hôtel du roi de Navarre, lorsqu'il épousa à Pau, le 30 mai 1581, damoiselle Bernadine DE LUGER, dame de Saint-Castin et et de Bernadets [1], fille de messire Martin DE LUGER, successivement avocat au Conseil souverain de Pau, secrétaire d'Etat du roi de Navarre, syndic de Béarn, du 9 avril 1568 au 25 septembre 1570 [2], et conseiller au parlement de Toulouse, et de damoiselle Jeanne DE FORBET, dame de Saint-Castin, sa première femme [3]. Jean-Pierre d'Abbbadie fut assisté, au contrat, de noble damoiselle Jeanne de Florence, sa mère, veuve du défunt *égregie* Me Bertrand d'Abbadie, président au Conseil du roi ; Me Pierre d'Abbadie, docteur en droit, abbé de Pimbo ; Me Gassiot d'Abbadie, lieutenant-général au siège de Saint-Sever, ses frères ; et de Bernard de Caplane, seigneur de Luc [4]. La damoiselle de Luger fut assistée, dans le même acte, de : damoiselle Jeanne de Castagnède, sa grand'mère ; noble Johanot de Luger, seigneur de Précillon ; du capitaine Jean du Vidou [du Bidou, *alias* de Bidou], de Lasseube ; de Ramonet de Guilhassot, de Gerderest, capitaine ; d'*égregie* Me Pierre de Pédesert, conseiller du roi ; de : Me Odet de Forbet, procureur patrimonial ; noble Jordan de Lane, seigneur de Hagedet [5] ; et de Gassie de Castagnède, oncle de la dite de Luger.[6]—Jean-Pierre d'Abbadie reçut, en faveur de son mariage, de Me Pierre d'Abbadie, abbé de Pimbo, héritier de la maison abbatiale de Maslacq, son frère, la somme de 4,000 livres tournois, hypothéquée sur la terre et seigneurie de Baleix.[7]—Bernadine de Luger fit son testament à Pau, dans sa maison appelée de Saint-Castin, le 16 mai 1588, et déclara, dans cet acte, qu'elle voulait être enterrée dans l'église de Saint-Castin.[8] Jean-Pierre d'Abbadie acheta, le 17 août 1591, pour le prix de 8,000 francs, de 10 sols tournois pièce, les seigneuries de Herrère, Escout et Escou [9], de haute et puissante dame Corisande d'Andoins, comtesse de

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[1] *Saint-Castin*, commune du canton de Morlàas et de l'arrondissement de Pau. *Sanctus Castinus*, 980, (cartulaire de Lescar.)—*Curtis quæ dicitur Sancti Castini cum appendiciis suis, scilicet Lar, Figueras et Bernedet*, vers 1030 (cartulaire de l'abbaye de Saint-Pé, d'après Marca, *Histoire de Béarn*, pages 214 et 248).—*Sent Castii*, 1385 (Censier).—En 1385, Saint-Castin comprenait 15 feux et ressortissait au bailliage de Pau.—Cette commune se trouve à 12 kilomètres de Pau et à 6 kilomètres de la petite ville de Morlàas et compte, aujourd'hui, 260 habitants.—*Lar*, hameau détruit, commune de Bernadets et de Saint-Castin ;—*Bernadets*, commune du canton de Morlàas ; *Higuères*, commune du canton de Morlàas, aujourd'hui *Higuères-Souye*.

[2] Voyez une note sur les Luger, aux *Pièces justificatives*, n° 1.

[3] Voir une note sur les Forbet, aux *Pièces justificatives*, n° 2.

[4] *Luc*, aujourd'hui *Luc-Armau*, canton de Lembeye, arrondissement de Pau.

[5] *Hagedet*, commune du canton de Castelnau-Rivière-Basse, arrondissement de Tarbes (Hautes-Pyrénées).

[6] Archives des Basses-Pyrénées, E. 2001, f° 317, v° ; E. 2006, f°s 65 et 126.

[7] Archives des Basses-Pyrénées. E. 2006, f° 63, v° ; E. 1239, f° 50.

[8] Archives des Basses-Pyrenées, E. 2007, f° 415.

[9] *Herrère*, *Escout*, *Escou*, communes du canton d'Oloron (est).

Guiche et de Louvigny, baronne de Lescun.[1] Il fut, pendant la Réforme, l'un des chefs du parti catholique en Béarn. Le 14 décembre 1594, à Gan, honorables hommes les seigneurs Pés de Pardies, bourgeois et marchand de Pau, Jacques de Marca, de Gan, et Guilhem de Dombidau, bourgeois et marchand d'Oloron, donnèrent une procuration à nobles Jean de Làas, seigneur d'Agnos, d'Issor[2] et d'autres lieux, et Jean-Pierre d'Abbadie, seigneur de Saint-Castin, pour emprunter 300 écus sol destinés aux frais d'un voyage que lesdits de Làas et d'Abbadie se proposaient de faire vers le roi, à l'effet de lui demander le rétablissement de la religion catholique en Béarn et l'admission des catholiques aux charges et dignités publiques.[3]—Jean-Pierre d'Abbadie entra dans les ordres, vers 1598, et fut évêque de Lescar, de 1599 à 1609.—Voici le beau portrait qu'a tracé de lui Jean de Bordenave, chanoine de Lescar : "L'evesque " de Lascar ressembloit un ancien patriarche et ceux qui l'ont entendu " parler en public, qui l'ont veu en chaire et ont eu cette grâce d'ouïr " couller de sa bouche la parolle de Dieu, rendront ce tesmoignage à la " vérité qu'ils n'ont jamais ouy parler avec plus d'éloquence, de gravité, " de zèle, ny d'intelligence des mystères de salut qu'à luy. C'estoit un " vieillard vénérable qui paitrissoit la manne de ses instructions avec tel " assaisonnement que les auditeurs n'en avoient jamais avec redondance, " jamais avec disette, tous avec suffisance, contentement et utilité."[4]— " Messire Jean-Pierre d'Abbadie, conseiller du roi en son Conseil d'Etat et évêque de Lescar," fit son testament à Pau, dans la maison de Saint-Castin, le 18 avril 1609. Il demande, dans cet acte, à être enterré dans l'église de Saint-Castin et que les honneurs funèbres lui soient rendus par son héritier, sous la direction des révérends pères Minvielle et Labarthe ; il veut que l'on érige dans cette église un monument honorable, suivant sa qualité ;[5] il lègue : aux pauvres et aux filles à marier de Herrère, Escou et Escout, l'artigue (pré) de Nouave ;[6] l'usufruit de

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[1] Archives des Basses-Pyrénées, E. 1794, f° 218 ; E. 2009, f° 86.

[2] *Agnos*, commune du canton d'Oloron (ouest) ;—*Issor*, commune du canton d'Aramits, arrondissement d'Oloron.

[3] Archives des Basses-Pyrénées, E. 1264, f° 111.

[4] Bordenave, *L'Estat des églises cathédrales et collégiales*, Paris, 1643, page 840 ; —Pierre de Marca, *Histoire de Béarn*, nouvelle édition, par l'abbé Dubarat, tome Ier, page xiv.

[5] L'église de Saint-Castin a été entièrement reconstruite, vers 1875. Nous avons appris que les ouvriers qui travaillèrent aux fondations du nouvel édifice découvrirent une épée antique et des restes de vêtement, de couleur violette. Les habitants de Saint-Castin ignorent qu'un évêque de Lescar ait été enterré dans leur ancienne église. Des fouilles un peu minutieuses auraient amené, sans doute, la découverte du tombeau de Jean-Pierre d'Abbadie.

[6] On lit dans une déclaration des députés et gardes de la communauté d'Escou, datée d'Escou, 6 février 1691 : " *Item*, déclarons que fu monsieur Jean Pierre d'Abbadie, evesque de Lescar et seigneur desdits lieux de Ferrère, Escou et Escout, par son testament du 18e avrilh 1609, legua en faveur de pauvres et filles a marier desdites trois communautés une piesse de terre pré, appellé Lartigue, scituée audit

la borde de Nouave, située à Escou, à Guillaume de Casenave, *alias* d'Abbadie, bachelier en droit ; 700 livres tournois à Me Jean d'Abbadie, son neveu ; et sa chapelle d'argent à l'église cathédrale de Lescar, lorsque le service religieux y sera rétabli ; il mentionne : damoiselle Bernadine de Luger, sa femme, défunte ; son fils, Bertrand, qu'il institue héritier, et sa fille Jeanne, mariée dans la maison de Juillac, de Marciac [1].—Jean-Pierre d'Abbadie mourut avant le 8 mai 1609, date à laquelle Me Jean d'Abbadie, procureur patrimonial et avocat au Conseil souverain de Pau, son neveu, requit l'ouverture de son testament.[2]—Il avait eu de Bernadine de Luger :

1° Bertrand D'ABBADIE, IIe du nom, dont l'article suit;
2° Un autre fils, mort jeune ;
3° Et Jeanne D'ABBADIE, mariée, comme on l'a vu, à M. DE JUILLAC, de Marciac.

III.—Noble Bertrand D'ABBADIE, IIe du nom, seigneur de Saint-Castin, de Herrère, d'Escout et d'Escou, vendit le 8 mai 1614, une pièce de terre, située à Lannecaube [3], en faveur de Me Raymond de Sosenx, marchand, de Pau,[4] et reçut, le 1er novembre 1618, à Escou, le serment de fidélité des habitants d'Escou, Escout et Herrère, ses vassaux.[5] Il fit cession, le 8 février 1624, de la seigneurie d'Aydie [6] en faveur de Me Hierosme de Capdeville, commendataire de justice,[7] et testa, le 28 novembre 1636,[8] après avoir eu de damoiselle Marie DU BIDOU, *alias* DE BIDOU, d'Orin [9] :

1° Jean-Jacques D'ABBADIE, Ier du nom, dont l'article suit :
2° Jean, *alias* Jean-Vincent D'ABBADIE DE SAINT-CASTIN, baptisé à Escout, le 25 mars 1626.[10] Prêtre et curé d'Arette [11], dans la vallée de Baretous, dès le 25 avril 1665, il produisit ses titres de noblesse, avec Jean-Pierre, son frère cadet, aussi prêtre, devant le sieur de Lartigue, subdélégué de M. d'Aguesseau, intendant, qui en donna acte et fut d'avis de les maintenir dans leur noblesse, le 8 mai 1670.[12]—Jean-Vincent d'Abbadie mourut à Oloron, le 15 septembre 1695 ; [13]

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lieu d'Escou, que les tresoriers desdites communautés afferment conjoinctement à la somme de vingt franc ou environ, annuellement, et cette somme est entreux partagée et employée par les tresoriers, chascun en sa parroisse, de l'advis des juratz et deputés, suivant la volonté dudit sieur testateur....." (Archives des Basses-Pyrénées, C. 1037.)

[1] *Juillac*, commune du canton de Marciac, arrondissement de Mirande (Gers).

[2] Archives de Herrère, GG. 42.

[3] *Lannecaube*, commune du canton de Lembeye, arrondissement de Pau.

[4] Archives des Basses-Pyrénées, E. 2024, fo 869, vo.

[5] Archives de Herrère, AA. 2.

[6] *Aydie*, commune du canton de Garlin, arrondissement de Pau.

[7] Archives des Basses-Pyrénées, E. 2031, fo 79, vo.

[8] Bibliothèque Nationale, *Collection Chérin*, volume Ier, D'ABADIE, en Béarn, I, fo 8.

[9] *Orin*, commune du canton d'Oloron (ouest).

[10] *Pièces justificatives*, no 3.

[11] *Arette*, commune du canton d'Aramits, arrondissement d'Oloron.

[12] Bibliothèque Nationale, *Collection Chérin*, volume Ier, D'ABADIE, en Béarn, I, fo 8.

[13] *Pièces justificatives*, no 4.

3° Pierre, *alias* Jean-Pierre D'ABBADIE DE SAINT-CASTIN, baptisé à Escout, le 22 janvier 1635.[1]—Il fut archiprêtre de Galan [2] et mourut avant le 16 janvier 1703 ;

4° Et Jeanne D'ABBADIE DE SAINT-CASTIN, née le jour de Saint-Laurent de l'année 1619 (10 août), baptisée à Escout, le 11 mai 1623.[3]

IV.—Messire Jean-Jacques D'ABBADIE, 1er du nom, seigneur de Saint-Castin, de Herrère, d'Escout et d'Escou, naquit à Escout, le 1er novembre 1620.[4] Institué héritier dans le testament de son père, il transigea, le 13 juillet 1652, avec les jurats, gardes et habitants de Herrère, Escout et Escou,[5] et obtint de Louis XIV, au mois de juillet 1654, l'érection en baronnie de sa terre de Saint-Castin.[6]—Jean-Jacques d'Abbadie épousa, par contrat du 4 février 1649, dans la maison de Bonasse, à Arette, damoiselle Isabeau DE BÉARN DE BONASSE, fille de feu noble Jacques DE BÉARN, seigneur de Bonasse, et de damoiselle Magdeleine DE LÀAS. Il fut assisté, dans cet acte, de noble Jean du Bidou, chanoine et vicaire général d'Oloron, son oncle ; et la future épouse de : damoiselle Magdeleine de Làas, autrement de Bonasse, sa nièce ; nobles Tristan de Béarn, curé d'Arette ; et Augier de Béarn, ses oncles paternels ; messire Charles de Lateulade, lieutenant pour le roi au gouvernement de Navarrenx ; messire Jean-Jacques de Béarn ; et de noble Gilles de Làas, major en la garnison de Navarrenx.[7]—Isabeau de Béarn de Bonasse mourut de la peste, à Arette, à l'âge de 24 ans, le 17 novembre 1652, et fut ensevelie dans le cimetière de l'église Saint-Pierre de cette commune.[8] —Jean-Jacques d'Abbadie décéda avant le 16 février 1666.—De leur mariage :

1° Jean-Jacques D'ABBADIE, IIe du nom, baron de Saint-Castin, seigneur de Herrère, d'Ecout et d'Escou, qui est dit fils et héritier de feu messire Jean-Jacques, seigneur et baron de Saint-Castin, dans un acte du 24 février 1666, par lequel il vendit, au moyen de Me Tristan de Larrouy, son fondé de procuration, une pièce de terre, appelée Poeymidou, située à Escou, en faveur des habitants dudit lieu, pour le prix de 1,266 francs, 6 sols, 8 deniers. [9] Il vendit encore, le 26 mai 1669, la seigneurie de Herrère, Escout et Escou en faveur de Me Raymond de Frexo, *alias* de Fréchou, bourgeois et marchand d'Oloron,[10] dénombra, le 16 novembre 1675, la seigneurie et baronnie de Saint-Castin, par l'intermédiaire de Me Jean de Labaig, d'Oloron, avocat au parlement de Navarre, son fondé de procuration et beau-frère ; [11] et mourut sans postérité ;

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[1] *Pièces justificatives*, n° 5.

[2] *Galan*, chef-lieu de canton de l'arrondissement de Tarbes (Hautes-Pyrénées).

[3] *Pièces justificatives*, n° 6.

[4] *Pièces justificatives*, n° 7.

[5] Archives des Basses-Pyrénées, E. 1828, f° 394.

[6] *Extraits des registres du Conseil souverain, du parlement et de la Chambre des Comptes de Pau, 1547-1691*, page 382 (Bibliothèque de M. l'abbé Dubarat.)

[7] Archives des Basses-Pyrénées, E. 1177, f°s 17 et 18.—Voir *Pièces justificatives*, n° 8.

[8] *Pièces justificatives*, n° 9.

[9] Archives des Basses-Pyrénées, E. 1828, f° 338.

[10] Archives des Basses-Pyrénées, E. 1828, f° 394.

[11] *Pièces justificatives*, n° 10.

2° Jean-Vincent D'ABBADIE DE SAINT-CASTIN, dont l'article suit;

3° Et Marie D'ABBADIE DE SAINT-CASTIN, baptisée dans l'église Saint-Vincent d'Escout, le 25 janvier 1650.[1] Elle épousa, dans l'église d'Arette, le 25 août 1669, M. Me Jean DE LABAIG [2], successivement avocat au parlement de Navarre, jurat d'Oloron, conseiller du roi, juge et lieutenant-général au sénéchal de cette ville, qui fit enregistrer son blason dans l'*Armorial de Béarn*, de 1696-1701.[3]

V.—Messire Jean-Vincent D'ABBADIE, seigneur et baron de Saint-Castin, naquit vers 1652 [4], probablement à Escout, et émigra, de bonne heure, au Canada, en qualité de lieutenant dans les troupes du roi. Il y épousa, vers 1688, Mathilde MATACONANDO, princesse indienne, fille de MATACONANDO, général en chef des indiens abenakis,[5] et devint comme le véritable roi de la puissante et belliqueuse nation des Micmacs.[6] Le 16 janvier 1703, à Oloron, "messire Vincent d'Abbadie, seigneur et baron "de Saint-Castin," accepta une obligation de 24,000 livres, de 20 sols tournois pièce, de la part de M. Me Jean de Labaig, conseiller du roi, son lieutenant-général au sénéchal d'Oloron, son beau-frère, et de Jean-Vincent de Labaig, avocat en la Cour, fils aîné de ce dernier, en représentation des sommes à lui dues par noble Jacques de Réarn, sieur de Bonasse, son oncle, et par noble Jean de Florence, abbé de Lescun [7] et d'Arette, acquéreur des biens dudit sieur de Bonasse, en vertu du contrat de mariage de messire Jean-Jacques de Saint-Castin avec la défunte Isabeau de Béarn-Bonasse, père et mère dudit sieur de Saint-Castin. Dans ce même acte, le baron de Saint-Castin acquitta ledit sieur de Labaig "de toute prétention qu'il pouvait avoir sur les legitimes de "défunts nobles Jean de Saint-Castin-Escout, curé d'Arette, et Jean-Pierre "de Saint-Castin-Escout, archiprêtre de Galan, ses oncles, et sur les biens "par eux délaissés . . ." Cet acte porte, enfin, quittance dudit sieur de Labaig en faveur du baron de Saint-Castin "des fournitures et avances "qu'il a faites pour lui, pendant son absence hors le royaume, comme "son procureur, depuis vingt et deux ans ou environ, en divers affaires "dudit sieur de Saint-Castin, jusques à présent....." [8] —Jean-Vincent d'Abbadie de Saint-Castin mourut avant le 3 février 1717.—Il avait eu de Mathilde Mataconando, Bernard-Anselme d'Abbadie, dont l'article suit :

VI.—Messire Bernard Anselme D'ABBADIE, seigneur et baron de

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[1] *Pièces justificatives*, nº 11.

[2] *Pièces justificatives*, nº 12.

[3] Dufau de Maluquer et Jaurgain, *Armorial de Béarn*, tome Ier, page 333.

[4] On a vu, ci-dessus, qu'Isabeau de Béarn de Bonasse, mère de Jean-Vincent d'Abbadie, mourut, le 17 novembre 1652. Elle avait contracté mariage, le 4 février 1649. Ses deux premiers enfants furent : Marie, née, le 25 janvier 1650, et Jean-Jacques, né en 1651. Jean-Vincent, qui était cadet, dut naître en 1652.

[5] Lettre de M. Joseph-Edmond Roy, du 20 novembre 1891.

[6] Joseph-Edmond Roy, *Le baron de Lahontan*, étude publiée dans les *Mémoires de la Société royale du Canada*, section I, 1894, page 73.

[7] *Lescun*, commune du canton d'Accous, arrondissement d'Oloron.

[8] *Pièces justificatives*, nº 13.

Saint-Castin, termina ses études au séminaire de Québec, en 1704 [1], et était lieutenant du détachement de la Marine au Canada, le 11 janvier 1716.[2] Il épousa, le 31 octobre 1707, Port-Royal, capitale de l'Acadie, demoiselle Marie-Charlotte D'AMOURS, fille de Louis D'AMOURS, seigneur de Jemsek[3].—Admis aux Etats de Béarn, dans l'ordre de la noblesse, le 28 avril 1717, pour la terre de Saint-Castin,[4] Bernard Anselme d'Abbadie donna quittance de la somme de 15,866 livres, 13 sols, en faveur de messire Jean, vicomte d'Echaux, le 30 juillet 1719,[5] et mourut avant le 16 juin 1728.[6]—Sa veuve décéda à Pau, le 27 février 1734, à l'âge de 45 ans, et fut enterrée, le lendemain, dans l'église Notre-Dame de cette ville.[7]—Ils avaient eu de leur mariage :

1° Marie-Anselme D'ABBADIE DE SAINT-CASTIN, dont l'article suit ;

2° Brigitte D'ABBADIE DE SAINT-CASTIN, qui étudia aux ursulines de Québec et tint sur les fonts de baptême, dans l'église Saint-Martin de Pau, le 23 février 1716, Louise d'Abbadie de Saint-Castin, sa sœur ;

3° Et Louise D'ABBADIE DE SAINT-CASTIN, née à Pau, le 23 février 1716 [8], mariée dans cette ville, le 23 juin 1735 [9], à Me Bertrand DE SARTHOPON, d'Accous, praticien.[10]

VII.—Marie-Anselme D'ABBADIE, baronne de Saint-Castin, naquit à Québec (Canada), vers 1711. Héritière de sa maison, elle épousa dans l'église du Faget d'Oloron [11], le 23 juin 1730 [12], noble Pierre DE BOURBON, avocat au parlement de Navarre, fils légitime de feu noble Jean DE BOURBON, aussi avocat au parlement de Navarre, seigneur de Sottou de Charre [13], et de dame Marie D'ABBADIE DE BASTANÈS [14].—Pierre de Bourbon fut admis aux Etats de Béarn, dans l'ordre de la noblesse, le 10 juillet 1731, comme seigneur de Saint-Castin [15], et mourut avant le 10 avril 1769 [16].

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[1] Lettre de M. Joseph-Edmond Roy, du 20 novembre 1891.

[2] Archives des Basses-Pyrénées, B. 4681, pages 1., 366 ; 617 ; 693 ; 776—B. 4682, page 195.

[3] Lettre de M. Joseph-Edmond Roy, du 20 novembre 1891.

[4] Archives des Basses-Pyrénées, C. 759, fos 15 et 129, vo, et C. 832, fo 6, vo.

[5] Archives des Basses-Pyrénées, E. 2085, fo 51, vo.

[6] Archives des Basses-Pyrénées, B. 4693, fo 441.

[7] *Pièces justificatives*, no 14.

[8] *Pièces justificatives*, no 15.

[9] *Pièces justificatives*, nos 16 et 17.

[10] Archives des Basses-Pyrénées, B. 4702, fo 203 ; B. 4704, fos 53 ; 80, vo ; 147, vo et 382.

[11] *Faget (le)*, village, commune d'Oloron-Sainte-Marie.

[12] *Pièces justificatives*, no 18.

[13] *Sottou*, fief, commune de Charre, canton de Navarrenx, arrondissement d'Orthez.

[14] *Pièces justificatives*, no 19.

[15] Archives des Basses-Pyrénées, C. 773, fos 59, vo et 108, vo.

[16] Archives des Basses-Pyrénées, B. 4764, fo 112, vo ; B. 4764 *bis*, fo 18.

Marie-Anselme d'Abbadie de Saint-Castin décéda à Oloron, le 18 juillet 1778, à l'âge de 67 ans [1].—Elle avait eu de son mariage :

1° Henri DE BOURBON, né à Oloron, le 29 mai 1731 [2], admis aux Etats de Béarn, le 10 avril 1769, pour la terre de Saint-Castin, dont sa mère lui avait fait donation, le 29 mars précédent [3].—Il mourut sans postérité ;
2° Pierre DE BOURBON, né à Oloron, le 23 mars 1733 ;
3° Anselme DE BOURBON, né à Oloron, le 8 juillet 1739 ;
4° Henriette DE BOURBON, dont l'article suit ;
5° Marie DE BOURBON, née à Oloron, le 5 juillet 1741 ;
6° Et Marie-Anselme DE BOURBON, née à Oloron, le 24 avril 1751 [4].

VIII.—Henriette DE BOURBON naquit à Oloron, le 23 mai 1737 [5]. Héritière de noble Henri de Bourbon, son frère, et en cette qualité baronne de Saint-Castin, elle épousa dans l'église Sainte-Croix d'Oloron, le 6 juillet 1773 [6], messire Jean DE DUFAU DE LALONGUE, chevalier de l'ordre royal et militaire de Saint-Louis, ancien capitaine au régiment de Normandie, né à Lalongue, le 12 janvier 1725, fils de noble Jean-Baptiste DE DUFAU, seigneur de Lalongue, de Lusson, abbé laïque de Lalongue [7], conseiller du roi, maire ancien et mitriennal, alternatif et mitriennal de la ville et communauté de Morlàas, et de dame Jacqueline-Ovide DE SAINT-MARTIN, de la ville de Paris [8]. — Admis aux Etats de Béarn, le 11 mai 1744, pour la seigneurie de Lalongue, dont son père lui avait fait donation, le 31 janvier de la même année [9], Jean de Dufau fut encore reçu dans cette assemblée, le 12 janvier 1774, comme seigneur de Saint-Castin et procureur de la dame Henriette de Bourbon, sa femme, dame dudit lieu.[10]—Jean de Dufau de Lalongue mourut à Pau, le 13 avril 1807, à l'âge de 82 ans.—Il avait eu de sa femme, décédée à Pau, le 13 prairial an XII (2 juin 1804), à l'âge de 67 ans :

1° Marie-Anselme DE DUFAU DE LALONGUE, dont l'article suit ;
2° Henriette DE DUFAU DE LALONGUE, née à Oloron, le 15 décembre 1776. Elle épousa suivant pactes sous seings privés, du 13 nivôse an VI (2 janvier 1798), et le 15 nivôse (janvier) de la même année, devant l'officier de l'état civil d'Aubertin (Basses-Pyrénées), Jean-Louis POEYDAVANT, fils de Pierre-Victor POEYDAVANT et de Thérèze SAVIGNY.—Jean-Louis Poeydavant mourut à Aubertin, le 30 août 1834, à l'âge de 62 ans.—Jean-Aimé POEYDAVANT, issu de son mariage, décéda dans cette commune, le 22 novembre 1830, à l'âge de 31 ans ;

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[1] *Pièces justificatives*, n° 20.
[2] *Pièces justificatives*, n° 21.
[3] Archives des Basses-Pyrénées, C. 805, f° 290, v°.
[4] *Pièces justificatives*, n°s 22, 23, 24 et 25.
[5] *Pièces justificatives*, n° 26.
[6] *Pièces justificatives*, n° 27.
[7] *Lalongue ; Lusson*, aujourd'hui *Lussagnet Lusson*, communes du canton de Lembeye, arrondissement de Pau.
[8] Voir une note sur les Dufau de Lalongue, aux *Pièces justificatives*, n° 28.
[9] Archives des Basses-Pyrénées, C. 787, f° 44, v°.
[10] Archives des Basses-Pyrénées, C. 809, f° 11, v°.

3° Et Marie-Magdeleine-Martine DE DUFAU DE LALONGUE, née à Oloron, le 10 novembre 1778.[1]

IX.—Marie-Anselme DE DUFAU DE LALONGUE, née à Oloron, le 2 septembre 1775 [2], épousa à Aubertin (Basses-Pyrénées), le 12 pluviôse an IV (1er février 1796), M. Pierre REYAU, américain[3], né à Ossun (Hautes-Pyrénées), fils de M. Pierre REYAU et de dame Marie LAVENTURE.—Pierre Reyau était membre du conseil municipal de Pau, depuis plusieurs années, lorsqu'il mourut dans cette ville, le 16 mai 1829, à l'âge de 80 ans. —Marie-Anselme de Dufau de Lalongue, sa veuve, décéda le 30 mars 1839, à l'âge de 93 ans, six mois et vingt-huit jours, dans sa maison sise à Pau, rue de la Préfecture, n° 44, après avoir eu de son mariage :

M. JEAN REYAU

1° Jean REYAU, portant en famille le prénom de Chéri, né à Pau, le 7 messidor an V (25 juin 1797). Il entra, en 1814, dans les gardes du corps de Louis XVIII et se retira du service de bonne heure. Fixé, vers 1824, sur un domaine appartenant à sa mère, à Aubertin (Basses-Pyrénées), il remplit les fonctions de maire de cette commune, de 1832 à 1848, et y mourut, le 24 août 1884, à l'âge de 87 ans, sans avoir contracté d'alliance ;

2° Jean-*Henry* REYAU, dont l'article suit ;

3° Jean REYAU, portant en famille le prénom de Théodore, né à Pau, le 14 germinal an VIII (4 avril 1800). Avocat, il fut nommé, au mois de juillet 1826,

[1] *Pièces justificatives*, nos 29 et 30.

[2] *Pièces justificatives*, no 31.

[3] Pierre Reyau avait été négociant en Amérique.

juge auditeur dans le ressort de la Cour royale de Pau, et, le 24 avril 1836, juge suppléant au Tribunal de première instance de cette ville. Substitut du procureur du roi à Oloron, le 12 mars 1839, juge à Lourdes, le 22 juillet 1845, appelé aux mêmes fonctions à Mont-de-Marsan, le 25 juin 1856, il fut admis à faire valoir ses droits à la retraite, le 25 avril 1870, et mourut sans avoir été marié ;

4° Jean-Hippolyte-Anna REYAU, né à Pau, le 27 ventôse an X (18 mars 1802) ;

5° Et Henriette-Céline REYAU, née à Pau, le 9 fructidor an XIII (27 août 1805), mariée dans cette ville, le 31 janvier 1825, à M. Nicolas LAVIELLE, né à Pau, le 1er janvier 1788, fils de M. Bernard LAVIELLE, successivement avocat au parlement de Navarre et à la Cour royale de Pau, l'un des jurisconsultes les plus distingués du midi, décédé à Pau, le 20 janvier 1829, doyen et bâtonnier de l'ordre des avocats, conseiller municipal de cette ville, et de Madame Marie DE CLAVERIE.—Nicolas Lavielle était avocat à la Cour de Pau et chevalier de la légion d'honneur, lorsqu'il fut élu député des Basses-Pyrénées, le 22 novembre 1834. Constamment réélu député jusqu'en 1848, il fut nommé directeur des affaires civiles au ministère de la justice, le 20 juillet 1838, premier président à la Cour de Riom, le 2 novembre 1839, et consolider à la Cour de Cassation, le 18 août 1844. Admis à la retraite, le 20 mai 1863 et nommé conseiller honoraire, il mourut à Portet (Basses-Pyrénées), le 21 juillet 1874.—Nicolas Lavielle avait eu de Henriette-Céline Reyau :

A.—Jean-Jacques-Charles-Bernard LAVIELLE, né à Pau, le 13 février 1829 ;

B.—Joseph-*Charles*-Bernard LAVIELLE, né à Pau, le 9 juin 1831, ancien président du Tribunal civil d'Orthez, marié à Mlle Louise LAGROLET, fille de M. Jean LAGROLET, conservateur des hypothèques à Montmorillon, et de Mme Gabrielle D'ARTHEZ-LASSALLE.—De cette union :

a. Laurent LAVIELLE ;
b. Gabrielle LAVIELLE ;
c. Marie LAVIELLE ;
d. Et Henriette LAVIELLE.

C.—Marie-Bernarde-*Louise*-Anselmine LAVIELLE, née à Pau, le 16 décembre 1825, alliée à M. Henri FOURCADE, consul de France à Malte. Elle est décédée à Pau, le 18 mai 1882, laissant deux fils, savoir :

a. Charles FOURCADE, ancien maire d'Auga, ancien conseiller général des Basses-Pyrénées ;
b. Et Jules FOURCADE.

D.—Marie-Catherine-*Amélie* LAVIELLE, née à Pau, le 22 octobre 1827, alliée à M. Victor DE GOUNON-LOUBENS, dont elle a eu :

Louis-Nicolas-*Jules* DE GOUNON-LOUBENS, né à Paris, le 26 juillet 1847, docteur en droit, conseiller à la Cour d'appel de Lyon.

E.—Et Françoise-Héloïse-Tècle-Ida LAVIELLE, mariée à M. Rose-Antoine-Eugène NICOLAU, conseiller à la Cour d'appel de Pau, chevalier de la légion d'honneur, veuf en premières noces de Mme Laure-Zoé CORNAC.—M. Nicolau est mort à Pau, le 6 juin 1879, à l'âge de 68 ans, laissant de sa seconde femme :

Marguerite-Louise-Gabrielle-Noëlie NICOLAU, née à Pau, le 24 décembre 1855, mariée, dans cette ville, le 25 juillet 1876, à M. *Louis*-Antoine-Bernard COULOMME, juge au tribunal de première instance de Bagnères (Hautes-Pyrénées), fils de M. Jean-Baptiste-Gustave COULOMME, président du tribunal de première instance de Pau, et de Mme Marie-Madeleine-Coralie PÉRÈS.

X.—Jean-*Henry* Reyau, naquit à Pau, le 27 nivôse an VII (16 janvier 1799.) Il entra, à 15 ans et demi, dans les gardes du corps de Louis XVIII, le 16 juillet 1814. Passé aux cuirassiers d'Angoulême, 3e régiment, le 24 janvier 1816, avec le grade de sous-lieutenant, il y fut promu lieutenant, le 9 janvier 1822, capitaine-adjudant-major, le 26 février 1823, capitaine-instructeur, le 3 décembre 1826, il fut mis en congé illimité, le 7 décembre 1830. Rentré au service, quelques mois plus tard, le 25 mars 1831, comme capitaine-instructeur au 9e cuirassiers, il fut nommé chef d'escadron au 10e régiment, même arme, le 21 janvier 1836. Lieutenant-colonel, d'abord au 2e lanciers, le 23 septembre 1839, puis, au 6e hussards, le 28 octobre de la même année, commandant du dépôt de remonte de Caen, le 22 novembre suivant, colonel du 1er cuirassiers, le 29 janvier 1843, il devint général de brigade, le 10 juillet 1848, et général de division, le 22 décembre 1851. Il commanda à une brigade de cavalerie à Lunéville, du 14 juillet 1848 au 17 janvier 1853, date à laquelle il prit le commandement de la division active de cavalerie à la même résidence. Membre du comité consultatif de cavalerie, le 5 janvier 1856, il commanda une division de cavalerie à l'armée de Lyon, le 5 mai 1859, revint à Lunéville, le 18 mars 1860, rentra au comité, le 2 octobre 1860, et en fut élu président, le 11 avril 1867. Au cadre de réserve, le 17 janvier 1864, le général Reyau n'hésita pas à reprendre les armes, au moment de l'invasion et commanda une division de cavalerie, d'abord au 12e corps, le 17 août 1870, puis au 20e, le 15 septembre 1870. Relevé de son commandement, sur sa demande, le 12 octobre 1870, il fut mis à la retraite, le 9 janvier 1880, après 64 ans, huit mois et vingt-quatre jours de service effectif.—Chevalier de la légion d'honneur, le 8 juin 1825, le général Reyau fut promu successivement : officier, le 19 juillet 1846 ; commandeur, le 24 août 1850 ; et grand-officier, le 28 décembre 1859.—Il mourut dans son château de Jurque, à Jurançon (Basses-Pyrénées), le 7 décembre 1885, à l'âge de 86 ans.—Il avait épousé à Nancy (Meurthe-et-Moselle), en 1823, Mlle Anne-Agnès-Françoise Regnault de Raulecour, née à Nancy, le 8 mars 1801, fille de M. Charles-Antoine-Joseph Regnault de Raulecour et de Madame Marie-Thérèse-Adélaïde-Alexandre de Saint-Baslemont.—Madame Reyau mourut au château de Jurque, à Jurançon, le 29 juillet 1874.—De cette union, Pierre-*Armand* Reyau, dont l'article suit.

XI.—Pierre-*Armand* Reyau naquit à Nancy, le 6 octobre 1823. Secrétaire particulier du préfet d'Eure et Loir, il fut nommé conseiller de préfecture des Pyrénées orientales, le 16 mars 1853, conseiller de préfecture des Basses-Pyrénées, le 17 août 1853, et se démit de ses fonctions, le 5 mai 1858. Il mourut au château de Jurque, à Jurançon, le 11 mai

1877, après avoir eu de son mariage avec Mlle Marie-Joséphine-Claire BOURGEOIS DE JESSAINT :

1° Elizabeth REYAU ; 2° Marie REYAU ; 3° Et Marthe REYAU.

ARMES DES D'ABBADIE, DE MASLACQ

ABBADIE D'ARBOUCAVE

ABBADIE DE SAINT-CASTIN

Les armes des d'Abbadie d'Arboucave étaient, d'après le baron de Cauna : *d'or à un arbre de sinople et un lévrier de gueules accolé d'argent, attaché à l'arbre par une chaîne de même, au chef d'azur, chargé d'un croissant d'argent, accosté de deux étoiles d'or.*[1]

Bernard D'ABBADIE D'ARBOUCAVE, évêque de Dax, et Jean D'ABBADIE-LAFUTSUN, écuyer, curé d'Ygos[2], firent enregistrer dans *l'Armorial de Guyenne*, le 10 février 1702, le blason suivant : *d'or, à un pin de sinople et un lévrier de gueules, passant devant le pied de l'arbre, et un chef d'azur, chargé d'un croissant d'argent, accosté de deux étoiles d'or.*[3]

Pierre D'ABBADIE, seigneur d'Abbadie de Maslacq, plaqua le sceau suivant sur le dénombrement de ses biens nobles, daté de Pau, 14 mars 1701 : écu *à un arbre et sur le tout un lévrier courant, au chef chargé de trois étoiles ;* timbré d'une couronne de baron.[4]

D'après la Chenaye-Desbois, les d'Abbadie, seigneurs d'Arboucave, de Saint-Germain et de Saint-Castin, en Béarn, portaient : *d'or, à l'arbre de sinople, au lévrier de gueules, accollé d'argent et attaché par une chaîne de même à l'arbre, au haut du fût ; au chef d'azur chargé d'un croissant d'argent, accosté de deux étoiles d'or.*[5]

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[1] Cauna, *Armorial des Landes*, tome III, page 27.

[2] *Ygos*, aujourd'hui *Ygos et St-Saturnin*, commune du canton d'Arjuzanx, arrondissement de Mont-de-Marsan (Landes).

[3] *Revue de Béarn, Navarre et Lannes*, 1884, tome Ier, page 94.

[4] Paul Raymond, *Description des sceaux des archives des Basses-Pyrénées*, n° 70.

[5] La Chenaye-Desbois, *Dictionnaire de la Noblesse : Table alphabétique des noms et armes des familles sur lesquelles on n'a point reçu de mémoires*, seconde édition, Paris, veuve Duchesne, 1770, page 1.

Chérin blazonne les d'Abbadie de Saint-Castin : *d'or, au pain de sinople, soutenu sur un croissant d'argent, et accompagné de deux autres croissans, aussy d'argent, surmontés d'un oyseau de même, au chef d'azur chargé de 3 étoiles d'argent.*[1]

Jean DE LABAIG, conseiller du roi, juge et lieutenant général au sénéchal d'Oloron, fit enregistrer sous son nom, dans l'*Armorial de Béarn*, le 17 juin 1701, le blason suivant qui n'est autre que celui de Marie D'ABBADIE DE SAINT-CASTIN, sa femme : *d'argent, au chesne de sinople, un lévrier de gueules passant au pied de l'arbre, et un chef d'azur chargé d'un croissant d'argent, accosté de deux étoiles d'or.*[2]

PIÈCES JUSTIFICATIVES

N° 1

NOTE SUR LA FAMILLE DE LUGER.

Gaillardet DE LUGER, habitant à Gan, chef de cuisine de Mgr le comte de Foix, figure dans divers actes des 11 janvier, 23 février 1467, 24 juin, 11 juillet 1468 et 4 août 1470.[3] Il était marié, dès le 11 avril 1467, avec Aunorette DE TRESSENTZ, de Gan.[4] Il acheta, le 5 mai 1471, une vigne à Saint Faust, pour 12 florins, de Guilhem de Laborde, *alias* de Gaillardou, de cette commune.[5] Gaillardet de Luger et Aunorette de Tressentz, de Gan, sa femme, vendirent, le 29 décembre 1484, une vigne à Gan, pour 110 francs, de 10 sols chacun, à Johanet de Luger, habitant à Lescar, et à Bertrane, sa femme.[6] Gaillardet de Luger était jurat de Gan, les 2 août 1485, 6 août et 22 novembre 1487.[7]

Vénérable mossen Barthélémy DE LUGER, chanoine de l'église cathédrale de Sainte-Marie d'Oloron, et Gratianne DE BORDENAVE, sa mère, achetèrent, le 13 juillet 1555, pour le prix de 600 francs, la seigneurie de Goès[8], de Me Raymond de Carrère, de Sainte-Colomme[9], procureur de noble Antoine de Montesquiu, seigneur de Sainte-Colomme.[10]—Barthélémy de Luger fit son testament à Sainte-Marie, le 27 septembre 1561, et mourut avant le 1er octobre de la même année[11]. Ses héritiers furent Me Fortic DE LUGER, d'Escout, son frère, secrétaire du roi et de la reine de Navarre, et Martin DE LUGER, fils de celui-ci, son neveu.

Barthélémy de Luger avait deux autres frères. Bertrand et Johanot

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[1] Bibliothèque Nationale, *Collection Chérin*, volume Ier, dossier D'ABBADIE, en Béarn, I, fo 8.

[2] Dufau de Maluquer et Jaurgain, *Armorial de Béarn*, tome Ier, page 333.

[3] Archives des Basses-Pyrénées, E. 2129, fos 22, vo ; 29, vo ; 31, vo ; et 80, vo.

[4] Archives des Basses-Pyrénées, E. 2129, fo 33.

[5] Archives des Basses-Pyrénées, E. 2129, fo 107.

[6] Archives des Basses-Pyrénées, E. 1261, fo 6, vo.

[7] Archives des Basses-Pyrénées, E. 1261, fos 13, vo ; 24 ; et 56, vo.

[8] *Goès*, commune du canton d'Oloron (est).

[9] *Sainte-Colomme*, commune du canton d'Arudy, arrondissement d'Oloron.

[10] Archives des Basses-Pyrénées, E. 1778, fo 39.

[11] Archives des Basses-Pyrénées, E. 1780, fo 453.

DE LUGER. Ce dernier devint seigneur de Précillon [1], à la suite de son mariage avec noble Jeanne DE LABORDE, dame dudit lieu, et reçut le serment de fidélidé de ses vassaux, le 26 décembre 1553.[2]

Gratianne DE LUGER, sœur des précédents, épousa honorable homme Jean, *alias* Johandet D'ARRAC, bourgeois, marchand et jurat de la ville de Gan

I.—Me Fortic DE LUGER, d'Escot, procureur de haut et puissant seigneur Gui, comte de Laval, et de haute et puissante dame Claude de Foix, comtesse de Laval, sa femme, seigneur et dame de Lautrec et de Lescun, consentit, le 9 avril 1547, à Sainte-Marie d'Oloron, l'affièvement d'une pièce de terre, située à Estialescq [3], en faveur de Jean du Fauret.[4] —Fortic de Luger vendit, le 8 mai 1553, une maison, à Gan, pour le prix de 80 écus, à Bernard de Lapuyade, jurat de Lasseube,[5] et devint secrétaire du roi et de la reine de Navarre.—Il eut d'une alliance ignorée Martin de Luger, dont l'article suit :

II.—Messire Martin DE LUGER, successivement avocat au Conseil souverain de Pau, secrétaire d'Etat du roi de Navarre et syndic général de Béarn, depuis le 9 avril 1568, fut destitué, le 25 septembre 1570, pour crime de lèse-majesté,[6] et devint, plus tard, conseiller au parlement de Toulouse. Il épousa : 1° Jeanne DE FORBET, dame de Saint-Castin et de Bernadets ; 2° Isabelle DE POUTZ [7].—Du premier lit vinrent :

1° Pierre DE LUGER, qui fut institué héritier par sa mère et mourut sans postérité ;

2° François DE LUGER, décédé aussi, sans postérité ;

3° Bernadine DE LUGER, dont l'article suit ;

4° Et Jeanne DE LUGER.

III.—Bernadine DE LUGER, dame de Saint-Castin et de Bernadets, épousa messire Jean-Pierre D'ABBADIE conseiller du roi de Navarre, maître des requêtes de son hôtel, puis évêque de Lescar.

Noble Marc-Antoine DE LUGER, seigneur de Précillon, plaqua le sceau suivant sur le dénombrement de ses biens nobles, daté de Pau, 23 octobre 1674 : écu *écartelé : 1 à un arbre, 2 à un canard passant, 3 au lion rampant, 4 au lévrier courant ;* timbré d'un heaume de face à lambrequins.[8]

N° 2

NOTE SUR LES FORBET, SEIGNEURS DE SAINT-CASTIN.

I.—Guillaume-Ramon DE FORBET, notaire de Pau, en 1511, puis, jurat de cette ville, acheta, le 7 mars 1513, à Denguin, pour le prix de

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[1] *Précillon*, commune du canton d'Oloron (est).

[2] Archives des Basses-Pyrénées, E. 1777, f° 339.

[3] *Estialescq*, commune du canton de Lasseube, arrondissement d'Oloron.

[4] Archives des Basses-Pyrénées, E. 1776, f° 315, v°.

[5] Archives des Basses-Pyrénées, E. 2130, f° 11.

[6] Paul Raymond, *Inventaire sommaire des archives des Basses-Pyrénées*, tome III, introduction, page 92.

[7] Archives des Basses-Pyrénées, E. 2003, f° 434.

[8] Paul Raymond, *Description des sceaux conservés aux archives des Basses-Pyrénées*, n° 435.

2,225 écus, de 18 sols chacun, la seigneurie de Saint-Castin des mains de nobles Arnaud d'Abbadie, seigneur de Denguin, et Catherine de Denguin, dame dudit lieu, sa femme.[1] Il fonda une prébende, appelée de Saint-Michel, dans l'église Saint-Martin de Pau, et laissa de noble Marie DU MONT, sa femme, qui vivait veuve, le 2 septembre 1532,[2] Jean de Forbet, dont l'article suit.

II.—Noble Jean DE FORBET, seigneur de Saint-Castin, de Bernadets, de Départ et d'Ozenx [3], en sa partie, rendit hommage pour ses biens nobles, à Jacques de Foix, évêque de Lescar, lieutenant-général du roi, le 31 janvier 1538, dans le palais épiscopal de Lescar.[4] Il épousa noble Jeanne DE CASTAGNÈDE, et fit son testament à Pau, le 17 juin 1553. Dans cet acte, il demanda à être enterré dans l'église Saint-Martin de Pau et dans le tombeau de sa maison.[5] Jeanne de Castagnède testa à Pau, dans la maison de Saint-Castin, le 8 janvier 1588. Elle institua pour héritière damoiselle Bernadine de Luger, sa petite-fille, femme de noble Jean-Pierre d'Abbadie, et lui substitua honorable homme Me Gassie de Castagnède, son frère, habitant à la Seube, [la Sauve] près Bordeaux.[6]—Du mariage de Jean de Forbet avec Jeanne de Castagnède étaient nés :

1° Pierre DE FORBET institué héritier dans le testament de son père et décédé sans postérité;

2° Jeanne DE FORBET, dont l'article suit.

III.—Jeanne DE FORBET, de la ville de Pau, dame de Saint-Castin et de Bernadets, épousa Me Martin DE LUGER, successivement avocat au Conseil souverain de Pau, secrétaire d'État du roi de Navarre, syndic de Béarn et conseiller au parlement de Toulouse, dont elle fut la première femme. Elle fit son testament à Pau, le 2 juillet 1569 [7].

Voyez la note sur les Luger, aux *Pièces justificatives*, n° 1.

N° 3

" Le vingt cinquiesme mars mil six cens vingt six, a esté baptisé Jean d'Abbadie, fils a noble Bertrand d'Abbadie, seigneur des lieux St Castin, Ferrere, Escout et Escon, et madamoyselle Marie du Bidau. Parin a esté

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[1] Cet acte porte que précédemment, feu noble Jean, seigneur de Denguin, avait vendu à réméré, à honorable homme Arnaud de Laborde, marchand, de la ville de Morlàas, aussi défunt, la seigneurie de Saint-Castin et ses dépendances, pour 700 écus, de 18 sols chacun.—Guilhem de Laborde, fils et héritier d'Arnaud de Laborde, consentit la cession de cette seigneurie, le 7 mars 1513, en faveur de nobles Arnaud d'Abbadie et Catherine de Denguin, sa femme, pour le prix de 700 écus. Le même jour, ces derniers vendirent la terre de Saint-Castin à Guilhem-Ramon de Forbet. (Archives des Basses-Pyrénées, E. 1982 et E. 1938, f° 40, v°.)

[2] Archives des Basses-Pyrénées, E. 1986, f°s 233 ; 245, v° et 261.

[3] *Départ*, village, commune d'Orthez ; ancienne commune.—*Ozenx*, commune du canton de Lagor, arrondissement d'Orthez.

[4] Archives des Basses-Pyrénées, B. 848, f° 69, v° ; B. 859.

[5] Archives des Basses-Pyrénées, E. 1993, f° 188, v°.

[6] Archives des Basses-Pyrénées, E. 2007, f° 288, v°.

[7] Archives des Basses-Pyrénées, E. 2000, f° 105.

monsieur deu Bidou, recteur de Sauvaterre [1] ;—marrine, damoiselle..... de Marca. L'office a esté fait par monsieur de Candomec, chanoine de Lescar et recteur de Ferrere, Escout et Escon." [2]

N° 4

" Le seise de septembre mil six cens nonante cincq, a esté enseveli chez les capucins noble Jean Vincent de St Castin Escout, prêtre et curé du lieu d'Arette en la valée d'Aspe, aagé d'environ septante ans, decedé hier dans la maison de Mr de Labaig, juge au senechal d'Oloron, ayant esté confessé par le pere Placide, capucin, et receu le saint viatique et extreme onction, administrés par moy, soubssigné ;—presens a sa sepulture ledit sieur de Labaig et Me Vincent de Labaig, d'Oloron, qui ont signé avec moy. — (Signé :) Labaig ; — Labaig ; — Lalhacar, p^tre et vicaire." [3]

N° 5

" Pierre, fils de noble Bertran d'Abbadie, seigneur de St Castin, et de madamoiselle Marie deu Bidou, sa feme, a esté baptisé le 22 de jenvier 1635 ; — parrin : Mr Jean Paul deu Bidou, p^tre et chanoine de S^te (*sic*) [Sainte-Marie] ; — marine : madamoiselle Gratianne de Marca, sa belle seur. (Signé :) Bagmalere, p^tre, recteur." [4]

N° 6

" Le 11 de may deu susdit an [1623], fo bateiada Joanna de Abadia, hilla de Mos^r Bertran de Abadia, s^r de St Castin, de Ferrera, Escout et Escon, e de madamisela Maria de Bidou ; — payri et mairia, mossur de Jullaq [Juillac] et madamisela Joanna de Abadia, sa muller, et la infanta bado lo jour de St Laurens et an de mill seis cens dets e nao." [5]

N° 7

" Le 12 de dezembre [1620], fo bateiat Joan Jaques de Abadia, hill de mos^r Bertran de Abadia, s^r de St Castin, e de madamisela Maria de Bidou de Orin. Lo payri, mossur de Bidou, son prime fray ;—mayria, mossur Uaron Duar, de la Baxar Nabarra [6]. Lo susdit infan fo vadut, la nueit de tots sans de ladita aneia." [7]

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[1] Lisez : *Herrère*, *Escout* et *Escou*.—*Sauveterre*, chef-lieu de canton de l'arrondissement d'Orthez.

[2] Archives d'Escout, *Etat civil*, GG. 1 ; 1615-1650.

[3] Archives d'Oloron, *Etat civil*, GG. 5, f° 37, v°.

[4] Archives d'Escout, *Etat civil*, GG. 1 : 1615-1650.

[6] Archives d'Escout, *Etat civil*, GG. 1 : 1615-1650.

[6] La marraine de Jean-Jacques d'Abbadie était, sans doute, la femme de *M. le baron d'Uhart, de la Basse-Navarre.*

[7] Archives d'Escout, *Etat civil*, GG. 1 : 1615-1650, f° 6.

N° 8

4 février 1649, à Arette :

CONTRAT DE MARIAGE ENTRE NOBLE JEAN-JACQUES D'ABBADIE, SEIGNEUR DE SAINT-CASTIN, D'ESCOUT, D'ESCOU ET DE HERRÈRE, ET DAMOISELLE ISABEAU DE BÉARN DE BONASSE.

"Notum sit que pactes et acords de maridage ont esté faictz et passés entre noble Jean Jacques, s^r de St Questin et des lieux d'Escout, Escon et Ferrere, d'une part, et damoiselle Isabeau de Bearn de Bonasse, d'Arette, d'autre, en la forme suivante, scavoir est que ledit s^r de St Questin, estant acisté de noble Jean du Bidou, canoine et viquaire general d'Oloron, son oncles, et prometant de faire advoer et ratifier les presentz a damoiselle Marie du Bidou, mere dudit s^r de St Questin, et de faire instituer pour son heritier ledit s^r de St Questin, son fils, de toutz ses biens et causes, a toutz jours et hures que besoinh sera, s'est promis bailher pour mary et ligitim espous a ladite damoiselle Isabeau, estant acistée de damoiselle Magdalenne de Las, autrement de Bonasse, sa mere, noble Tristan de Bearn, recteur dudit lieu, et Augier de Bearn, ses oncles paternals, messire Charles de Lateulade, lieutenant pour le roy au gouvernement de Navarrux [Navarrenx], messire Jean Jacques Bearn, de noble Giles de Las, mayor en la guarnison de Navarrux, ses proches parans, et autres, s'est promise balher pour femmme et ligitime espouse au dit s^r de St Questin ; lequel mariage toutes parties ont promis effectuer en face de nostre mere sainte eglize, un mois apres que l'une partie en sera requize pour l'autre. En faveur duquel mariage, ladite damoiselle Magdalenne de Laas, autrement de Bonasse, acistée comme dessus, en qualité de vefve de feu noble Jaques de Bearn et tutrisse et administeresse de leurs enfans, biens et causes, a promis de balher et payer audit s^r de St Questin, pour la dot de ladite damoiselle Isabeau, sadite filhe, la somme de douze mille livres, payables, scavoir est : les six mille livres, le jour des amenances de ladite damoiselle Isabeau, sa filhe, et les autres six mille livres, deux ans apres lesdites amenances, sans interets jusqu'audit terme, de quoy et du tout ledit s^r de St Questin sera teneu octroger, au premier pacq, quitance et a la fin du payement, carte de tornadot, en bonne forme, a la reserve de quinze cens livres, desquelles ladite damoiselle Isabeau pourra dispauser a sa volonté ; et lesdits s^r de St Questin et ladite damoiselle Isabeau, futturs conjuntz, ont fait et institues pour leurs heretiers leurs enfans, de leur mariage provenans, de toutz leurs biens et causes, apres leur fin, se reservant, neanmoinx, d'instituer tel d'icux enfans pour heretier des biens qu'ils aquerront, que bon leur semblera, et cependant, lesdites parties ont convenu que ledit s^r de St Questin faict agensement et constitué a ladite damoiselle Isabeau la somme de trois mille livres, et, parelhement la damoiselle feit et constitué d'agensement en quinze cens livres, et ce en cas de predessès de l'un ou de l'autre d'entreux ; et pour tout ce que dessus tenir, observer, lesdites partides, l'une reciproquement vers l'autre, chascun ainsy qu'il leur touche, ont obligé etc. ; informé etc. ; constitué etc. ; renoncé etc. ; juré etc.—Feit et passé audit lieu d'Arette, dans ladite maison de Bonasse, le quatriesme jour du mois de febrier mil six cent quarante neuf, presents et temoinx Me Pierre de Catalan, curé d'Aramitz et Lanne, noble Hanry d'Aramitz, et moy, Jean Dufaur, notaire."

" Notum sit que, aujourd'huy, hutieme febrier mil six cent quarante neuf, pardevant moy, notaire et tesmoinx bas nommés, s'est constituée, [de sa libre] volonté, damoiselle Marie du Bidou, autrement de St Questin, a laquelle a esté leu le present de contract de maridage, mot par mot, et iceluy donné a entandre, laquelle, de son bon gré, a apprové, sy que advoe et ratifie iceluy contract, consentant qu'il sorte a son plen et entier effect, en toutz ses chef, et, par expres, ladite damoiselle feit et institué pour son heritier universal ledit sieur Jean Jacques de St Questin, son filh, de toutz ses biens et causes, presentz et fucturs, apres sa fin, soy reservant la moyoue (*sic*) et administration pendant sa vie, et de disposer de la somme de mille franx de l'agensement a elle par feu noble Bertran de St Questin, vivant son mary, faict, sy bon luy sembles, prometant a ce dessus en rien ne contraudire, soubz obligation etc. ; informé etc. ; juré etc.; es presences de Me Pierre de Catalan, curé d'Aramitz et Lanne, et Manaud, menor de Tappie, d'Aramitz, et moy, Dufaur, notaire, qui etc." [1]

N° 9

" Le dix septiesme de novembre 1652, desceda noble Isabeau de St Castin, fille [de] noble Jasques de Bearn et noble Magdalenne de Laas, *morbo pestis, et jacet in cœmeterio ecclesiæ S^ti Petri presentis loci d'Arette*, agée de 24 ans.—(Signé :) J. d'Espalle, vicaire." [2]

N° 10

16 novembre 1675, à Pau :

DÉNOMBREMENT DE MESSIRE JEAN-JACQUES D'ABBADIE, IIe DU NOM, SEIGNEUR ET BARON DE SAINT-CASTIN.

" 1.—C'est l'aveu et denombrement que je, messire Jean Jaques d'Abbadie, seigneur et baron de St Castin, metz et baille par Me Jean de Labaig, d'Oloron, advocat en parlement, mon procureur spéciallement fondé, pardevant vous, nos seigneurs les commissaires, deputés par le roy pour la confection du papier terrier dans le ressort du parlement de Pau, de la terre, seigneurie et baronnie de St Castin, seize en la souveraineté de Bearn, senechausée de Morlas, mouvante en plain fiefs et hommage de Sa Majesté, mon souverain seigneur, a cause de sadite souveraineté, laquelle seigneurie et baronnie m'est escheüe par le descès de feu messire Jean Jaques d'Abbadie, baron de St Castin, mon pere ; et a luy par la succession de messire Bertran d'Abbadie, seigneur dudit lieu, Herrere et Escout, son pere, et au dit sieur Bertran, mon ayeul, par le descez de messire Jean Pierre d'Abbadie, vivant conseiller du roy et maistre de requestes au Conseil souverain de Bearn et, du despuis eveque de Lescar, son pere, fils de messire Bertran d'Abbadie, abbé lay de Maslacq, seigneur de Baleix et president audit Conseil souverain de Bearn, lequel seigneur Jean Pierre d'Abbadie, mon bisayeul, estoit devenu seigneur de ladite terre par son mariage avec dame Bernadine de Luyer [Luger], heritiere de St Castin et de Bernadetz, laquelle tenoit ladite seigneurie de la suc-

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[1] Archives des Basses-Pyrénées, E. 1177, f°s 17 et 18.

[2] Archives d'Arette, *Etat civil*, GG. 1, f° 88, v^o.

cession de feu messire Martin de Luyer, son pere, vivant secretaire d'estat du roy de Navarre et, du despuis, conseiller du roy de France au parlement de Tholose [Toulouse] ; ladite seigneurie conciste en basse et moyenne justice, maison seigneurialle, jardin, enclos et fossez en un tenant, terres nobles et droits seigneuriaux, ainsy que s'ensuit :

2.—Premierement, je suis seul seigneur dans toute l'estandue de ladite seigneurie et baronnie de St Castin, quy a ses bornes et confrontations certaines, savoir : du costé d'oriant, avec la seigneurie de Maucor : du costé du midy, avec celle de Buros : du costé d'occidant, avec le vilage de Serres, et du costé septantrio, avec celuy de Bernadetz ; et en tout ce quy est comprins dans l'enceinte desdites bornes et limites, j'ay justice moyenne et basse.

3.—*Item*, j'ay fais et crée seul les baile et jurats dudit lieu de St Castin, quy rendent la justice en mon nom et cognoissent des matieres civilles et criminelles, excez, bès de sang, querelles et debatz, carnaux des bestes estrangeres dans toute l'estandue de ladite seigneurie de St Castin, a raison de quoy je jouis des droitz et amandes establies par le for et coustume du pays pour les seigneurs, lesquels baile et juratz je droit de destituer et changer, quand bon me semble.

4.—*Item*, j'ay les lotz et ventes ou capsoo des ventes rigoureuses ou amoureuses quy se font en ma directe, avec le droit de preparance.

5.—*Item*, j'ay droit de faire prester le serment de fidellité à chaque maistre des maisons de ladite seigneurie.

6.—*Item*, j'ay le droit de chasse et de peche dans le terroir de St Castin, à l'exclusion de tout autre.

7.—*Item*, j'ay droit dans ma directe d'emprisonner mes soumis et les mettre aux traces, suivant le for, pour leurs excez et delitz.

8.—*Item*, j'ay droit de vendre et faire vendre par menu et en detail le vin de mon cru que je leve sur ledit lieu, par preferance à tous au res.

9.—*Item*, j'ay le droit de banalité en ladite terre, suivant le for, avec les droitz de contenus en icelluy.

10.—*Item*, j'ay droit de coupe dans le bois commun, pour mon chaufage et provision.

11.—*Item*, pour raison de ladite seigneurie, j'ay suis apellé aux Estatz generaux de la province ou je voix deliberative, comme les autres gentillommes, sans qu'aucun exploit de justice ny execution me puisse estre faitte que par les beguers ou huissiers de la Cour.

12.—*Item*, il m'est deub par mes soumis et autres les fiefs suivants que je prends annuellement, lesquels je possede noblement comme dependans de madite seigneurie.

13.—Premierement, la communauté de St Castin me fait par an un fief de deux franx, neufs sols bons, un liard ;

14.—*Item*, le maistre de la maison abbatialle de St Castin me fait un quartal d'avoine, une poule et six sols bons en argent ;

15.—*Item*, le maistre de la maison de St Jean me fait un quartal d'avoine et trois sols bons, cinq liars ;

16.—*Item*, du maistre de la maison d'Arriutort, un quartal d'avoine, une poule et quatorse sols bons et demy ;

17.—*Item*, du maistre de la maison de Bàas, un quartal d'avoine, une poule et dix et huit sols bons ;

18.—*Item*, le maistre de la maison de Bayu, un quartal d'avoine, une poule et huit sols bons, trois liars ;

19.—*Item*, le maistre de la maison de Braquette, un baquette ;

20.—*Item*, le maistre de la maison de Brosana, un quartal d'avoine, une poule et douse sols bons, six deniers ;

21.—*Item*, le maistre de la maison de Bruchoua, un quartal d'avoine, une poule et onse liars ;

22.—*Item*, le mais de la maison de Broqua, un quartal d'avoine, une poule et trois franx, trois sols bons et trois liars ;

23.—*Item*, le maistre de la maison de Barber, un quartal d'avoine et sept liars ;

24.—*Item*, le maistre de la maison de Barrere, un quartal d'avoine, une poule et un franc, six sols bons, trois liars ;

25.—*Item*, la nommée Audine de Barrere, trois liars et trois baquettes ;

26.—*Item*, le maistre de la maison de Beguerie, un quartal d'avoine, une poule et un franc, huit sols, deux liars et demy ;

27.—*Item*, le maistre de la maison de Bouer, un franc, neuf sols, deux liars ;

28.—*Item*, le maistre de la maison de Bouerat, un quartal d'avoine une poule et sept sols bons, deux deniers ;

29.—*Item*, le maistre de la maison de Boy, un quartal d'avoine, une poule et deux liars, deux baquettes ;

30.—*Item*, le maistre de la maison de Capdeville, neuf liars trois baquettes ;

31.—*Item*, le maistre de la maison de Caplau, un quartal d'avoine, une poule et un franc, trois sols bons et demy ;

32.—*Item*, le maistre de la maison de Cassegnolle, un quatal d'avoine, une poule et un franc, deux sols bons et demy ;

33.—*Item*, le maistre de la maison de Crestiàa, un quartal d'avoine, une poule et trois sols bons ;

34.—*Item*, le maistre de la maison de Lacroux, cinq sols bons, un denier ;

35.—*Item*, le maistre de la maison de Lafitte, un quartal d'avoine, une poule et six sols bons, trois liars ;

36.—*Item*, le maistre de la maison de Coudure, un quartal d'avoine et une poule ;

37.—*Item*, le maistre de la maison de Gées, un franc, six sols bons, quattre liars ;

38.—*Item*, le maistre de la maison de Gourgues, un quartal d'avoine, une poule et neuf sols bons ;

39.—*Item*, du maistre de Granger sept liars ;

40.—*Item*, le maistre de la maison de Gros, trois mesures d'avoine, une poule et trois franx, neuf sols bons, trois liars ;

41.—*Item*, le maistre de la maison de Guichamans, quattre mesures d'avoine, deux poules, quattre franx, quattre sols bons, un liard ;

42.—*Item*, le maistre de la maison de Guichassy, un quartal d'avoine, une poule et deux sols bons, trois baquettes ;

43.—*Item*, le maistre de la maison de Saibou, un quartal d'avoine, une poule et deux sols bons, trois baquettes ;

44.—*Item*, le maistre de la maison de Haur, un quartal d'avoine, une poule et deux frans, quatre sols bons, deux liars ;

45.—*Item*, le maistre de la maison Hialer, un quartal d'avoine, une poule et un franc, neuf sols bons, trois liars ;

46.—*Item*, du maistre de la maison Horgue, un quartal d'avoine, une poule et trois sols bons, quatre liars ;

47.—*Item*, le maistre de la maison de Horgassy, un quartal d'avoine, une poule et deux frans quatre sols bons, quatre deniers ;

48.—*Item*, le maistre de la maison de Laryau, un quartal d'avoine, une poule et un franc, six sols bons ;

49.—*Item*, le maistre de Larroturon, trois mesures d'avoine, une poule et huit sols bons, six deniers ;

50.—*Item*, le maistre de Louhiron, un quartal d'avoine, une poule et sept liars ;

51.—*Item*, la maison de Mesplet Ambou, un quartal d'avoine, une poule et un franc, sept sols bons, cinq liars ;

52.—*Item*, la maison de Louspaus, un quartal d'avoine, deux poules et deux frans, neuf sols bons ;

53.—*Item*, la maison de Pedestauc, cinq sols, deux deniers ;

54.—*Item*, le maistre de la maison de Pedurte, huit sols bons, deux liars, trois baquettes ;

55.—*Item*, Perrequer trois jaques, faisant six baquettes ;

56.—*Item*, le maistre de Mousegnerat, une mesure d'avoine et six sols bons et demy ;

57.—*Item*, Plechot, cincq baquettes ;

58.—*Item*, le maistre de Poutz hauret, un quartal d'avoine, une poule et six sols bons ;

59.—*Item*, le maistre de la maison de Puyou, un quartal d'avoine, une poule et deux franx ;

60.—*Item*, le maistre de la maison de Pouchan, un quartal d'avoine, une poule et sept sols bons, quattre liars ;

61.—*Item*, le maistre de la maison de Robert, un quartal d'avoine, une poule et deux franx, trois sols bons, deux liars et deux baquettes ;

62.—*Item*, le maistre de la maison de Salette, un quartal d'avoine, une poule et deux sols bons, quattre liars ;

63.—*Item*, le maistre de la maison du Sarthou, un sol ;

64.—*Item*, le maistre de la maison de Sarrailler, un sol bon, trois liars, un denier ;

65.—*Item*, le maistre de la maison de Solacrop, deux baquettes :

66.—*Item*, le maistre de la maison de Tausia, un quartal d'avoine, une poule et un franc, deux sols bons ;

67.—*Item*, le nommé Ten, un franc, neuf sols, cinq liars ;

68.—*Item*, le maistre de la maison de Tisner, un quartal d'avoine, une poule et quattre sols bons, trois liars et deux baquettes ;

69.—*Item*, la maison de Trey, un quartal d'avoine, une poule et un franc, six sols bons, trois liars ;

70.—*Item*, la maison de Tapie, un quartal d'avoine et une poule ;

71.—*Item*, Clarmontine Despaux, cinq baquettes ;

72.—*Item*, le maistre de la maison de Baquer, de Serres, quatorze liars et demy, pour les terres qu'il tient en ma directe ;

73.—*Item*, le maistre de Baliros, de Navailles, deux sols pour les terres qu'il tient en ma directe ;

74.—*Item*, le maistre de la maison de Baradat, de Bernadetz, quattre liars pour les terres qu'il tient en ma directe ;

75.—*Item*, le nommé Cos, dit Chin, de Montardon, un sol pour les terres qu'il tient en ma directe ;

76.—*Item*, le nommé Courtade, dudit lieu de Montardon, un sol pour les terres aussy de ma directe ;

77.—*Item*, le maistre de Hondagné, de Buros, trois liars pour les terres qu'il tient en ma directe ;

78.—*Item*, le maistre d'Estalas, de St Armou, trois liars pour les terres qu'il tient, aussy, en ma directe ;

79.—*Item*, le maistre de la maison de Laryau, de Buros, me fait quattre liars pour les terres qu'il tient en ma directe ;

80.—*Item*, le maistre de la maison de Perer, de Maucor, quinze liars pour les terres qu'il possede dans ma directe ;

81.—*Item*, le maistre de la maison de Salettes, de Serres, cinq sols bons et demy pour les terres qu'il tient en ma directe ;

82.—*Item*, je possede dans ledit lieu de St Castin la place et fossez ou estoit l'ancien chateau de St Castin, contenant un arpent, trois quartz, a perche grosse de terre noble ;—confronte : du costé d'oriant, avec chemin public, terre de Guillamon et de Barber ; du costé du midy, avec terre dudit Barber ; du costé d'occidant, avec terre de Menjot et de la maison abbatiale ; du costé du septentrion, avec terre de ladite maison abbatialle et dudit de Barber ;

83.—*Item*, je possede dans ledit lieu le bois apellé Tausia, contenant quarante deux arpens, un quart de terre noble, a grosse perche, dans lequel je seul droit de coupe, soit de bois, soit de fogiere ;—confronte : du costé d'oriant, aveq terre de la communauté de Maucor et de Bayu, de

St Castin ; du costé du midy, avec bois commun dudit Maucor, ruisseau entre deux et terre et bois d'Auger, de Maucor ; du costé d'occidant, avec terre, bois et labourable de Puyou, terre de Menjot, de St Castin, et terre bois du Baile, de Maucor ; du costé du septentrion, avec terre labourable chatagnerée, bois et touya dudit Menjot, de St Castin ;

84.—*Item*, j'ay possede audit lieu une vigne ruralle, contenant..... .... ; confronte : du costé d'oriant, avec terre de Them ; du costé du midy, avec terre de mesme Them ; du costé d'occidant, avec terre dudit Them ; et du costé de septantrion, avec terre du mesme Them ;

85.—Pour raison de laquelle seigneurie et baronnie, j'ay presté l'homage au roy, en sa chambre des comptes de Navarre, soubz la redevance d'un fer de lance doré ;

86.—Lequel aveu et denombrement je certifie veritable, sauf le plus ou le moins, prometant que s'il vient autre chose a ma cognoissance d'en faire la declaration au roy ou a ses officiers ;—et, a cause de l'absance dudit sieur baron de St Castin, Me Jean de Labaig, d'Oloron, advocat au parlement de Navarre, son procureur spéciallement fondé, a signé et icelluy scellé des armes dudit sieur baron.—Fait a Pau, le seisieme novembre mil six cent soixante et quinze.—(Signé :) LABAIG, procureur susdit.—Collectionné par moy, soubssigné, commis au greffe de la commission, (signé :) BAUDIN."

" Jean Baptiste Desmaretz, chevalier, seigneur de Vaubourg, baron de Cramaille, conseiller du roy en ses Conseils, maistre des requetes ordidaire de son hostel, intendant de justice, police et finances en Bearn et Basse Navarre, commissaire deputé par Sa Majesté pour la reformation de ses domaines et des provinces de Bigorre et Soulle ;

Veu : le denombrement fourny par noble Jean Jacques d'Abadie, le 10 [16] novembre 1675, de la seigneurie et baronnie de Saint Castin, circonstances et dependances, avec les proces verbaux de publication au bas d'iceluy, deüement controllez, ou est fait mention de l'opposition des habitans de St Castin et des nommez Barber, Boy et Mosseguerat ; — hommage presté au roy par le denombrant en la chambre des comptes de Navarre, le 12 janvier mil six cent soixante sept ;—contract d'affranchissement fait par Raymond Arnaud, seigneur de Caune [Cauna] et de St Castin, des habitans dudit lieu de St Castin et de leurs biens, sous la reserve de la seigneurie et justice, caps et preparance, fiefs et droits de bannalité et battere, en date du mercredy, apres la feste de St Valentin 1345 ;—denombrement fourny pardevant Jacques de Foix, evesque de Lescar, commissaire a ce deputé, le 31 janvier 1538, par noble Jean de Forbet, des seigneuries de St Castin, Bernadets et autres, avec tous droits jurisdictionnels et feodaux ;—acte de serment de fidelité presté au denombrant [1] par lesdits habitans de St Castin, le troisieme septembre 1651 ; —declaration faite au greffe de la reformation, le 23e feburier mil six cent soixante dix sept, par le procureur du denombrant, qu'il ne pretend sur ledit Barber, opposant, qu'une mesure d'avoine et sept liards de fief, et sur ledit Boy qu'une mesure d'avoine, une poule et deux liards et demy

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[1] Il faut lire : au *père du* dénombrant.—Jean-Jacques d'Abbadie, dénombrant, était né en 1651.

aussy, de fief et qu'il consant que ledit Mosseguerat demeure dechargé du fief sur luy denombré, attendu que ledit fief est acquitté par le nommé Caplau, au moyen de quoy lesdits opposans se sont departis de leurs oppositions ,—autre declaration faite audit greffe, le dixieme juillet mil six cent quatre vingt trois, par les jurats et habitans de Sainct Castin, qu'ils se departent, pareillement, de leur opposition, a la reserve du droit de coupe dans les bois communs, designé en l'article dix dudit denombrement et de la noblesse du bois, exprimé en l'article quatre vingt trois, a l'egard desquels deux chefs ils persistent en leurdite opposition ;—contredit de Pierre Bourgeois, fermier des domaines de Bearn :—conclusions du procureur du roy en la reformation desdits domaines, signées de Hericourt ; —et tout considéré :

Nous avons debouté ledit sieur d'Abadie du droit de carnal porté en l'article troisieme du denombrement par luy fourny, ensemble du droit prohibitif de peche couché en l'article six, comme aussy de la préférence pour la vente en detail du vin de son crû contre tout autre vin, exprimée en l'article huit, sans prejudice de ladite preferance à l'egard du vin etranger ; et, au surplus, declarons ledit denombrement avoir esté bien et deüement fait, leu et publié, avons iceluy receu et authorisé, et, en consequence, maintenu le denombrant en la seigneurie et baronnie de St Castin, fiefs, biens et droits nobles y contenus, sauf l'opposition des habitans de Sainct Castin, a l'egard du droit de coupe dans les bois communs, enoncé en l'article dix et de la ruralité pretendue du bois tousia, declaré noble en l'article quatre vingt trois ; sur quoy les parties se pourvoiront pardevant les juges ordinaires, ainsy qu'elles adviseront bon estre ; le denombrant maintenu comme dessus, sous le devoir d'un fer de lance doré, lors de la prestation des foy et hommage et a la charge de rendre le service personnel et autres droits et devoirs deus a sa Majesté, suivant le for et usage du pays et, en outre, de laisser au greffe de nostre commission copie en bonne forme dudit denombrement et de nostre present jugement.—Fait a Pau, le troisieme avril mil six cent quatre vingt sept. (Signé :) DESMARETZ DE VAUBOURG." [1]

N° 11

"Le vingt et cinquieme jour du mois de janvier mil six cens cinquante, a esté baptisé dans l'eglise St Vincens d'Escout, damoyselle Marie de St Castin, fille legitime de Monsieur de St Castin et d'Isabeau de Bonace, mary et femme ;—parrin et marrine, noble Jean de Vidou, grand vicaire de Monsieur d'Oloron, et de damoyselle Marie de Bydou, mere dudit sieur de St Castin ;—par moy, (signé :) Castaignos." [2]

N° 12

" Le vingt et cinquiesme aoust mille six cens soixante et neuf, maistre Jean de Labaig, d'Oloron, advocat, et damoyselle Marie de St Questin (*sic*) ont receu la benediction nuptialle en l'eglise de St Pierre d'Arrette, en presence de leurs plus proches parens et amis ;—et l'administration en a esté faite par moy, soubsigné. (Signé :) Frincheboy, vicaire." [3]

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[1] Archives des Basses-Pyrénées, B. 654, f° 336 et B. 6013.

[2] Archives d'Escout, *Etat civil*, GG. 1, 1615-1650.

[3] Archives d'Arette, *Etat civil*, GG. 1, f° 143.

N° 13

16 janvier 1703, à Oloron :

RÈGLEMENT DE COMPTES ENTRE VINCENT D'ABBADIE, SEIGNEUR ET BARON DE SAINT-CASTIN, ET JEAN DE LABAIG, SON BEAU-FRÈRE.

" Au nom de Dieu.—Par devant moy, notaire retenteur, et en presence des temoins, bas nommés, a esté constitué personnellement messire Vincent Dabbadie, seigneur et baron de St Castin, lequel de son bon gré etc. a fait cession, donnation et francq transport irrevocable vers et en faveur de Monsieur Me Jean de Labaig, conseiller du roy et lieutenant general au senechal de la present ville, son beau frere, present et acceptant, de toutes les sommes en capital, interetz et depens qui lui sont deues par noble Jacques de Bearn, sieur de Bonnasse, oncle dudit sieur de St Castin, et par noble Jean de Florence, abbé de Lescun et d'Arette, comme acquereur et possesseur des biens dudit sieur de Bonasse, soit en vertu du contrat de mariage de feu messire Jean Jacques de St Castin et de la defunte dame Isabeau de Bearn Bonnasse, pere et mere dudit sieur de St Castin, cedant, soit en vertu des arrets que ledit sieur de St Castin a obtenus contre lesdits sieurs de Bonnasse et de Florence, en y comprenant le contrat de ferme de Herriou, de Herrere ; comme aussi, ledit sieur de St Castin a fait cession, comme dessus, en faveur dudit sieur de Labaig, de la somme de deux mille cent dix livres de capital et des interets legitimes qui sont deubs audit sieur de St Castin sur les heredités des deffunts Messieurs du Hau, debiteur principal, de Higueres et d'Aren, ses cautions, en vertu de l'obligation du premier de février mille six cens septante, octroyée en faveur dudit sieur de Bonasse, laquelle obligation, en capital et intérêts, a esté adjugée audit sieur de St Castin, par sentence arbitralle du 21 juillet dernier, rendue entre luy et le dit sieur de Florence, duquel ledit sieur de St Castin promet de retirer incessament ladite obligation et de la remettre audit sieur de Labaig, avec un procès intenté de la part dudit sieur de Bonnasse contre les heritiers desdits sieurs du Hau, de Higueres, d'Aren, au moyen duquel procès ladite obligation n'est pas prescritte ; comme aussi, ledit sieur de St Castin en a acquitté et acquitte ledit sieur de Labaig de toute pretention qu'il a ou pourroit avoir sur luy pour la juissance que le dit sieur de Labaig a eue jusqu'a present, d'une petite vigne, d'un bois et d'une fogiere que ledit sieur de St Castin possede en sa terre de St Castin ; comme aussi, de tous les recouvremens que ledit sieur de Labaig a faits par soy ou par autruy, des droits seignuriaux de ladite terre, ensemble de tous les recouvrements que ledit sieur de Labaig a faits dudit sieur de Bonnassé et, speciallement, par la ferme des biens dudit sieur de Bonnasse, en qualité de procureur dudit sieur de St Castin ou ailleurs, en quel autre part et en quelle maniere que ce soit ; comme aussi, ledit sieur de St Castin a aquitté et aquitte le dit sieur de Labaig de toute pretention que ledit sieur de St Castin pourroit avoir sur les legitimes des deffunts nobles Jean de St Castin Escout, curé d'Arete, et Jean Pierre de St Castin Escou, archiprestre de Galan, ses oncles, et sur les biens par eux delaissés ; et la dite cession, transport, donnation et aquittation susdites de ce dessus et de toute autre pretention quelconque que ledit sieur de St Castin pourroit avoir sur ledit sieur de Labaig, ont esté faittes au moyen de la somme de vingt et quattre mille livres de vingt sols tornois piesse, que ledit sieur de Labaig, ensemble Jean Vincent,

son fils aisné, advocat en la Cour, aussi present, ont promis, ledit fils avec congé dudit sieur son pere, qui promet de l'en relever, de payer solidairement audit sieur de St Castin, sçavoir la somme de vingt mille livres avec l'interet a cinq pour cent, depuis ce jour d'hui, et les quattre mille livres restantes, sçavoir, deux mille sans aucun interet, quand ledit sieur de St Castin en aura besoin, et les autres deux mille livres restantes, pandant deux ans, sans aucun interet, aussi, jusques alors ; et, passé ledit terme, ledit interet a cinq pour cent, sans que ladite somme puisse estre augmentée ni diminuée, sur aucun pretexte ni fondement, ni quelle que soit la liquidation et le montant desdites pretentions cedées par ledit sieur de St Castin sur lesdits sieurs de Bonnasse et de Florence et sur les heritiers desdits sieurs du Hau, Higueres et d'Aren ; et au moyen, aussi, de ce dessus, ledit sieur de Labaig, pere, a aquitté et aquitte ledit sieur de St Castin de toutes les sommes qui peut avoir payées en descharge dudit sieur de St Castin, et, speciallement, de la somme de mille cinq cens et quelque livres, payées au sieur de Lamarque, procureur de monseigneur le ducq de Gramond, en vertu d'une sentence des requetes de l'hostel et d'une sentence arbitralle, pour les terres d'Escout, Escou et Herrere, vendues par le feu sieur de St Castin, aisné, au feu sieur de Frexo et dont la quittance publique, du 9e juin 1687, octroyée par ledit Lamarque, avec ladite sentence des requetes de l'hostel et les procurations esnoncées en ladite quittance, ont esté remises audit sieur de St Castin ; comme aussi, ledit de Labaig a aquitté et aquitte ledit sieur de St Castin de la somme de quatre mille livres que ledit sieur de Labaig fit conter, de l'ordre dudit sieur de Saint Castin au sieur Chanyon, banquier de La Rochelle, le 28 de mars 1700, par une lettre d'eschange du 21 de mars 1700, dont la seconde a esté remise par ledit sieur de Labaig audit sieur de St Castin, avec des lettres dudit sieur de Chanyon audit sieur de Labaig, contenant la reception de la lettre premiere d'eschange desdites quattre mille livres, le recouvrement d'icelles ; comme aussy, ledit sieur de Labaig a aquitté et aquitte ledit sieur de St Castin des fournitures et avances qu'il a faittes pour luy, pendant son absence hors le royaume, comme son procureur, depuis vingt et deux ans ou environ, dans la poursuitte du procès, fondements desdits arrets et en d'autres affaires dudit sieur de St Castin, jusques a present, soit en cette province, soit au Conseil ou au parlement de Tholose, et de ces peines et vacations et depens extraordinaires, et s'est reservé de recouvrer sur ledit sieur de Bonnasse ou sur ledit sieur de Florence, qui le represente, ce qui se trouvera estre deub en capital, interets et depens audit sieur de Labaig, pour reste d'une partie de la dot constituée a la dame son epouse par ledit feu sieur de St Castin, aisné, soubs le cautionnement dudit sieur de Bonnasse, en vertu de son contrat de mariage, a l'esgard de quoy ledit sieur de Labaig se reserve l'hipoteque et le privilege d'iceluy ; comme aussi, ledit sieur de Labaig a aquitté et aquitte ledit sieur de St Castin de toutes les autres fournitures et avances qu'il peut avoir fait pour luy jusques a present, pour la verification du denombrement de ladite terre de St Castin, pour la prestation de l'homage, comme son procureur, dont il lui a remis les actes, avec les sacqs et productions, dont en iceux et generalement de toutes pretentions a lui cedées par ledit sieur de St Castin au della de ladite somme de vingt et quattre mille livres, si dessus promise et au della de ladite compensation, volant et entendant qu'il profitte seul de l'excedant, si aucun il y en a, tant a raison de leur amitié et alliance que pour son indemnité, a raison de la longue poursuitte desdits proces, sans que les debiteurs delegués

puissent, sur aucun pretexte, demander aucune moderation desdites sommes cedées sur eux par ledit sieur de St Castin, lequel a subrogé et subroge ledit sieur de Labaig en ses droits, privileges et hipoteques, toutefois, sans aucune eviction ni garantie, luy a cedé ses actions, constitué procureur comme en sa cause propre, avecq pouvoir d'adverer que lesdites sommes cedées, mentionnées auxdits actes, sont bien et legitimement deues et d'en poursuivre le payement par telles voyes qu'il conviendra audit sieur de Labaig ou de s'accorder ou de transiger en la maniere [qu'il] le voudra et pourra, a ses perils et risques. Il a esté, neanmoins, convenu que pour le payement de ladite somme promise [par] ledit sieur de Labaig, ledit sieur de St Castin sera tenu de prendre sur lesdits sieurs de Bonnasse et de Florence les sommes, interets et depens qui seront adjugés audit sieur de Labaig, en vertu des droits dudit sieur de St Castin, soit en justice, par arrest, soit a l'amiable, par quelque accord que le dit sieur de Labaig pourroit faire avec eux ou avec ledit sieur de Florence seul, et ledit sieur de St Castin ne pourra pretendre sur ledit sieur de Labaig, du jour de la liquidation que ce qu'il ce trouvera estre deub au dela par ledit sieur de Labaig audit sieur de St Castin, pour raison desdites vingt et quattre mille livres et interets susdits, si dessus promis, declarant, d'ailleurs, ledit sieur de St Castin que le sieur de Labaig luy a remis la vaisaille d'argent qu'il avoit retirée du feu sieur de Lamouroux, jurat de Ste Marie, pour un depot fait en ses mains, et quelques assiettes d'argent que le dit sieur de Labaig avoit retiré de feu Monsieur du Camp, maistre de comptes, ainsi qu'il a aparu de deux accords, l'un publicq et l'autre privé, et que le dit sieur de Labaig a remis, si devant, audit sieur de St Castin, et tant luy que lesdits sieur de Labaig ont promis, chacun pour ce qui les concerne, de ne revoquer ce dessus en aucune maniere, ains au contraire, d'executer en tous chefs le present acte, soubs obligation etc. ; sousmis etc. ; constitué etc. ; renoncé etc. ; juré etc.—Fait a Oloron, le seisieme jour du mois de janvier mille sept cens trois, presents et temoins Me Hierosme de Leglise, bourgeois et marchand d'Oloron, Me Bertran de Davancens, aussi bourgeois et marchand de ladite ville d'Oloron, et moy, Jean de Capdeville, notaire publicq de ladite ville d'Oloron, qui le present acte ay receu et signé avecq lesdits sieurs de Labaig, pere et fils, ledit sieur de St Castin et temoins. Signés a l'original : LABAIG, pere ;—LABAIG, fils ;—S^T^ CASTIN ;—DABANCENS, présent ;—LEGLISE, présent ;—CAPDEVILLE, notaire.—Controllé et scellé a Oloron, le 31 janvier 1703. Solvit dix et sept livres. Signé a l'original : CHAILLOU." [1]

N° 14

" L'an mil sept cens trente quatre et le vingt sept fevrier, est decedée dame Marie Charlotte d'Amour, veuve de noble Anselme de St Castin, baron dudit lieu, agée de quarante cinq ans, et a esté enterrée dans l'église Notre Dame, a l'entrée de la grande porte, dans le vestibule, le vingt huitieme dudit mois. (Signé :) Des Baratz, curé de Pau." [2]

N° 15

" Louise de St Castin, fille de noble Anselme, baron de St Castin, et de dame Marie Charlote d'Amour, son epouse, étant née, le 23e fevrier

[1] Archives des Basses-Pyrénées, E. 1847, f° 332, v°.

[2] Archives de Pau, *Etat civil*, GG. 26, f° 3.

1716, a été presentée au st bapteme par Me Pierre Laborde, capitaine, et demoiselle Brigite de St Castin, et a été baptisée par le sieur Duplàa, vicaire en second. (Signé :) Sarthou, vicaire de Pau." [1]

N° 16

[Du 12e juin 1735 :] " Promesse de mariage entre Bertrand Sarthoupon, d'Acous, de la vallée d'Aspe, et demoiselle Marie Louise de St Castin, de cette paroisse, pour la premiere et dernière." [2]

N° 17

23 juin 1735, dans l'église Saint-Martin de Pau : Mariage du sieur Bertrand de Sarthopon, praticien, du lieu d'Accous, avec demoiselle Marie-Louise de St Castin, de la paroisse de Pau. [3]

N° 18

[Du 21 mai 1730.] " Il y a promesse de mariage entre noble Pierre de Bourbon, advocat au parlement de Navarre, habitant a Oloron, fils legitime de feu noble Jean de Bourbon, aussy advocat, son pere, et de feu dame Marie d'Abbadie Bastannès, d'une part, et entre demoiselle Marie Anselme, baronne de St Castin, native de Quebec, en Canada, habitante de cette paroisse, fille legitime de feu messire Anselme, baron de St Castin, et de dame Marie Charlotte de Damour (*sic*), de ladite ville de Quebec, d'autre." [4]

N° 19

" Le vingt et trois juin mil sept cens trente, les bans ayant esté duement publiés dans cette eglise, comme, aussy, dans celle de St Martin de Pau, ainsy qu'il nous a apparu du certifficat du sieur Desbarats, curé de ladite paroisse, ont epousé et receu la benediction nuptialle dans l'eglise du Faget de la present ville, noble Pierre de Bourbon, avocat en la Cour, agé d'environ trente ans, et demoiselle Marie Anselme de St Castin, en presence des sieurs Gaspard de Leglise, curé du present lieu, Pierre de Peborde, advocat en la Cour, et noble Jean de Vergès, d'Oloron, qui ont signé avec lesdits epoux et moy, (signé :) P. Bourbon ;—de St Castin :—Peborde, présent ;—Bergès, présent ;—H. Bourbon, curé de Leduix [Ledeuix] ;—Leglise, curé." [5]

N° 20

" Le vingt juillet mil sept cens septante huit, a esté ensevelie dame Marie Anselme Dabadie, epouse de feu noble Pierre de Bourbon, baronne

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[1] Archives de Pau, *Etat civil*, GG. 12, fo 40, vo.

[2] Bibliothèque de Pau, *Publications de mariage de la ville de Pau*, GG. 201, 1730-1742, 1o 16, vo.

[3] Archives de Pau, *Etat civil*, GG. 25, fo 21, vo.

[4] Bibliothèque de Pau, *Publications de mariage de la ville de Pau*, GG. 200, fe 26, vo.

[5] Archives d'Oloron, *Etat civil*, GG. 6, fo 97.

de St Quastin, agée de soixante sept ans, decedée avant hier, apres avoir recu les sacremens, dans sa maison, au Marcadet ;—presens a sa supulture le sieur Henri de Bourbon, pretre et curé de Ledeuix, son beau frere, et noble Jean Dufau de Lalongue, chevalier de l'ordre de St Louis, son gendre, qui ont signé avec moy, (signé :) H. Bourbon, curé ;—Dufau de Lalongue ;—Faurie, curé." [1]

N° 21

" Le vingt neuf may mil sept cens trente un, j'ay batisé Henri, fils de noble Pierre de Borbon, avocat en la Cour, et dame Marie Anselme, barone de St Castin, mariés, né aujourd'huy ;—parrains : Monsieur Henri de Borbon, pretre et curé de Leduix, et damoiselle Marguerite de Pimbou, qui ont signé avec moy. (signé :) H. Bourbon. curé de Leduix ;—de Pimbou ;—Soubielle, vicaire." [2]

N° 22

" Le vingt et trois mars mil sept cens trente et trois, j'ay baptisé Pierre, fils de noble Pierre de Bourbon, avocat et baron de St Castain et de dame Marie Ancelme de St Castin, mariés, né aujourd'huy ;—marrine, Françoise de Louhau, qui n'a sceu signer. (Signé :) Leglise, curé." [3]

N° 23

" Le huitieme juillet mil sept cens trente neuf, j'ai baptisé Anselme, fils de noble Pierre de Bourbon, seigneur de St Castin, et de dame Anselme de St Castin, mariez, né aujourd'huy ;—parreins. noble Henry de St Castin et demoiselle Anne de Labarrare, du lieu de Bugnen [Bugnein], laquelle a signé avec moy, non le parrein pour ne sçavoir. Signé :) Sedze, vicaire ;—Anne de Labarere." [4]

N° 24

" Le cincq juillet mil sept cens quarante et un, j'ay baptisé Marie, fille de noble Pierre de Bourbon et de dame Anselme de St Castin, mariés, née aujourd'huy :—parrein, le sieur Pierre de Bourbon, frere de la baptisée, qui a signé avec moy. (Signé :) Bourbon ;—Leglise, curé." [5]

N° 25

" Le vingt quatre avril [1751], j'ay baptisé Marie Anselme, fille de noble Pierre de Bourbon, baron de St Castin, et dame Marie Anselme de St Castin, mariés, née aujourd'hui ;—marraine, demoiselle Henriette de Bourbon, qui a signé avec moy, (signé :) Leglise, curé." [6]

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[1] Archives d'Oloron, *Etat civil, Sépultures de l'église Sainte-Croix*, 1772-1780, f° 94.
[2] Archives d'Oloron, *Etat civil*, GG. 6, f° 126.
[3] Archives d'Oloron, *Etat civil*, GG. 6, f° 184.
[4] Archives d'Oloron, *Etat civil*, GG. 7, f° 305, v°.
[5] Archives d'Oloron, *Etat civil*, GG. 7, f° 193, v°.
[6] Archives d'Oloron, *Etat civil*, GG. 8, f° 239.

N° 26

"Le vingt et huict may mil sept cens trente et sept, j'ay baptisé Henriette, fille de noble Pierre de Bourbon, baron de St Castin, et avocat en parlement, et de dame Marie Ancelme de St Castin, mariés, née aujourd'huy ;—parrin, Henri de Bourbon, qui n'a sceu signer. (Signé :) Leglise, curé." [1]

N° 27

"Le six juillet mille sept cent septente et trois, ont reçu la benediction nuptiale messire Jean Dufau de Lalongue, ancien capitaine au regiment de Normandie, chevalier de l'ordre royal et militaire de St Louis, natif, du lieu de Lalongue, fils legitime de noble Jean Baptiste Dufau, seigneur de Lalongue, Luzon et Levialer [Lusson et Vialer], d'une part, et demoiselle de Bourbon, fille legitime de noble Pierre de Bourbon, baron de St Castin, les bans de leur mariage ayant été publiés par trois dimanches consecutifs au prone de la messe de paroisse, tant dans cette paroisse que dans celle de Pau, dont ledit messire Dufau de Lalongue est habitant depuis plusieurs années, ainsy qu'il conste du certificat du sieur Labat, vicaire de Pau, duement legalisé, sans qu'audit mariage il s'y soit trouvé aucun empechement canonique ny civil, ny oposition de personne ; presents a la celebration noble Jean de St Martin de Beyrie, seigneur dudit lieu, et messire Antoine de Laa, juge, conseiller du roy et lieutenant general de la senechaussée de cette ville, et noble Joseph de Guirail et Me Jean Proharam, de cette ville, qui ont signé avec moy. (Signé :) de Lalongue ;—Henriette de Bourbon ;—Làa, juge ;—Guirail ;—St Martin de Beyrie ;—Proharam ;—D. Bourbon, curé, celebrant, du consentement de Mr le curé." [2]

N° 28

NOTE SUR LA FAMILLE DE DUFAU DE LALONGUE.

I.—Noble Jean DE DUFAU, Ier du nom, acheta, le 31 décembre 1717, de messire Charles Deschiens de Laneuville, maître des requêtes et président au parlement de Navarre, les seigneuries de Lalongue, Lusson, Vialer et Bésaçour, et fut admis aux États de Béarn, comme seigneur de Lalongue, le 31 mai 1719.[3]—Il mourut à Lalongue, le 24 janvier 1728, et fut enterré dans l'église Saint-Martin de cette commune, dont il était, aussi, abbé laïque. [4] Il avait eu de son mariage avec dame Antoinette-Martine DE DUFAU, qui fit son testament au château de Lalongue, le 2 juillet 1741 [5], et mourut audit lieu, le 22 mars 1743, à l'âge de 96 ans ou environ [6], Jean-Baptiste, dont l'article suit.

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[1] Archives d'Oloron, *Etat civil*, GG. 7, fo 406, vo.

[2] Archives d'Oloron, *Etat civil, Baptêmes et mariages de l'église de Sainte-Croix*, 1772-1780, fo 38, vo.

Archives des Basses-Pyrénées, C. 761, fo 51, vo.

[4] Archives de Lalongue, *Etat civil*, GG. 3, *Sépultures*, 1718-1737.

[5] Etude de Me Alfred Dieuzaide, notaire à Lembeye, acte au rapport de Pierre de Cassou, notaire de Lembeye, *Testaments*, no 8.

[6] Archives de Lalongue, *Etat civil*, GG. 3.

II.—Noble Jean-Baptiste DE DUFAU, seigneur de Lalongue, Lusson, Vialer et Bésacour, abbé laïque de Lalongue, baptisé, le 18 mars 1700, fut pourvu, suivant lettres, datées de Paris, 22 janvier 1723, de l'office de conseiller du roi, maire ancien et mitriennal, alternatif et mitriennal de la ville et communauté de Morlàas, aux gages annuels de 1,080 livres [1], et fut reçu aux Etats de Béarn, le 18 juillet 1725, pour la seigneurie de Lusson, que son père lui avait donnée, le 16 juillet de la même année. [2] Il épousa, le 9 janvier 1724, dans l'église de Lalongue, dame Jacqueline-Ovide DE SAINT-MARTIN, fille de M. Jacob DE SAINT-MARTIN, bourgeois de la ville de Paris.— Jacqueline-Ovide de Saint-Martin mourut à Lalongue, le 2 mai 1736 [3], après avoir eu de son mari :

1° Jean DE DUFAU, IIe du nom, dont l'article suit ;
2° Jean-Jacques DE DUFAU, né à Lalongue le 23 mai 1726 ;
3° David DE DUFAU, né à Lalongue, le 15 janvier 1731 ;
4° Jean-Baptiste DE DUFAU, né à Lalongue, le 25 octobre 1733 ;
5° Marie DE DUFAU, née à Lalongue, le 22 novembre 1729 ;
6° Toinette-Martine DE DUFAU, née à Lalongue, le 9 mai 1732 ;
7° Et autre Marie DE DUFAU, née à Lalongue, le 23 mars 1735 [5].

III.—Noble Jean DE DUFAU, IIe du nom, né à Lalongue, le 12 janvier 1725 [6], épousa demoiselle Henriette DE BOURBON, baronne de Saint-Castin.

N° 29

" L'an mil sept cens soixante seize et le quinze decembre, est née et, le lendemain, a été baptisée Henriette, fille legitime de mesire Jean Dufau de Lalongue, chevalier de l'ordre royal et militaire de St Louis, et d'Henriette de Bourbon, barone de St Castin ;—parrins ont été le noble Henry de Bourbon, curé de Leduix [Ledeuix], et demoiselle Genevieve Susane Dufau de Lalongue, qui ont été représentés par Chrisostome Lignette et par Françoise Lasserre, dit Gourgues, d'Escou. Le représentant a signé, non la représentante pour ne sçavoir, interpellée de ce faire par moy, (signé :) Lignette ;—Nouseilles, vicaire." [7]

N° 30

" Le onze nobembre mil sept cens septante huit, j'ay baptisé Marie Magdelaine Martine, fille legitime de noble de Jean de Lalongue (*sic*), chevalier de l'ordre militaire de St Louis et baron de St Questin, et de dame Henriette de Bourbon, mariés, née hier ;—parrins, maître Paul Bajar [Bayard] offitier dans le regiment des bandes bearnoises, et demoiselle

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[1] Archives Nationales, V1, 255, *Maires*, no 330.—Cette charge avait été achetée pour le prix de 24,000 livres.

[2] Archives des Basses-Pyrénées, C. 767 fo 298.

[3] Archives de Lalongue, *Etat civil*, GG. 3, *Mariages*, 1718-1737.

[4] Archives de Lalongue, *Etat civil*, GG. 3, *Sépultures*, 1718-1737.

[5] Archives de Lalongue, *Etat civil*, GG. 3, *Baptêmes*, 1718-1751.

[6] Archives de Lalongue, *Etat civil*, GG. 3, *Baptêmes*, 1718-1751.

[7] Archives d'Oloron, *Etat civil, Baptêmes et mariages de l'église Sainte-Croix*, 1772-1780, fo 146.

Marie Magdelaine de Bajar Laffore, parens de la baptisé, qui ont signé avec moy.—(Signé :) de Bayard Laffore ;—Paul Bayard ;—Faurie, curé." [1]

N° 31

" L'an mil sept cens soixante quinze et le vingt et deux septembre, est né et a été baptisée Marie Enselme, fille legitime de mesire Jean Dufau de Lalongue, ancien capitaine au régiment de Normandie, chevalier de l'ordre royal et militaire de St Louis, et de dame Henriette de Bourbon ; —parrins ont été noble David de St Martin, seigneur de Hagetobin [Haget-Aubin], ancien tresorier des troupes, et dame Marie Enselme Dabadie, barone de St Castin, veuve de noble Pierre de Bourbon, lesquels parrin et marreine ont été representés par Jean Dabadie, de Hagetobin, et par Marie de Cassiau, de Bugnin [Bugnein]. Les representants n'ont signé pour ne sçavoir interpellés de ce faire par moy, (signé :) Nouseilles, vicaire." [2]

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[1] Archives d'Oloron, *Etat civil, Baptêmes et mariages de l'église Sainte-Croix*, 1772-1780, f° 194.

[2] Archives d'Oloron, *Etat civil, Baptêmes et mariages de l'église Sainte-Croix*, 1772-1780, f° 117.

ROYAL SOCIETY OF CANADA

TRANSACTIONS

SECTION II.

ENGLISH HISTORY, LITERATURE, ARCHÆOLOGY, ETC.

PAPERS FOR 1895

I.—*The Canadian Dominion and proposed Australian Commonwealth: A Study in Comparative Politics.* (1)

By J. G. BOURINOT, C.M.G., LL.D., D.C.L., LIT. D.

(Read May 15th, 1895.)

I.

No one can deny that the most important feature of the present reign has been, not the victories won by Great Britain in foreign wars, for these are but insignificant compared with those of other times; not triumphs in diplomacy, for they have not been remarkable, and Canadians will hardly consider even the Bering Sea treaty an equivalent for the Oregon or Maine surrender; not even success in literature, for more lasting fame has been probably won by writers of other periods; not the extraordinary expansion of commerce and wealth, which has resulted from the evolution of sound economic ideas, national enterprise, and scientific discovery. No, assuredly the most significant and enduring achievement of the reign has been the economic, intellectual and political development of those prosperous communities which form the colonial empire of the British Isles. We have had quite recently some evidence of the remarkable growth, and the imperial aspirations of these countries, in the conference that has been held, in the political capital of the Dominion, of delegates from eight free, self-governing colonies in Australasia, South Africa and America, who came together for the express purpose of discussing questions which affect not merely their own peculiar and sectional interests, but touch most nearly the unity and integrity of the empire at large. Such a conference was an evidence not only of colonial expansion and ambition, but an acknowledgment of the importance of Canada in the councils of the wide imperial domain of England, since it was not at London, but under the shadow of the parliament buildings, at Ottawa, that colonists met for purposes of deliberation. The fact that such a conference was possible in the year of grace 1894 is the most expressive testimony that could be borne to the success of the colonial policy of a reign which has given so admirable a system of government, not merely to Canada, but to all those colonies that have attained so favourable a position among the communities of the world.

Every lover of imperial interests will watch with some curiosity the

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[1] This paper is intended as a supplement to a series of papers on Comparative Politics in the previous volumes of the Transactions, VIII. and XI., sec. 2. These papers were on: (1) The English Character of Canadian Institutions. (2) The Political Systems of Canada and the United States. (3) Federal Government in Switzerland. (4) Parliamentary compared with Congressional Government.

later stages of a movement, so clearly in the direction not only of the commercial development of the colonies, but also of imperial strength and unity, as is this important conference. Conferences of this character give us the best possible evidence that colonial statesmanship at the present time has a decided tendency, not towards isolation from the parent state and the establishment of independent nations, but rather towards placing the relations between England and her colonial possessions on a wider basis of community of interest and action.

II.

Whatever may be the immediate commercial results of the intercolonial conference, it is quite likely that so important an assemblage of representatives of the scattered colonies of the empire must more or less stimulate a deeper interest in the affairs of each other. It was for many reasons a happy idea that this second colonial conference—the first having been held in London seven years before—should have met at the political capital of the Canadian Dominion, which occupies a pre-eminent position among the colonial possessions on account of it having been the first to carry out successfully a plan of colonial federation. The fact that the parliament of the federation was sitting at the time of the conference was a fortunate circumstance from which no doubt the Australasian and South African delegates derived not a little practical benefit. A federal parliament, composed of two Houses, in which seven provinces and a vast territory, extending over three million and a quarter square miles, were represented by upwards of three hundred members, was of itself an object lesson for colonies which still remain politically isolated from each other, and in a very little better position than that occupied by the Canadian provinces thirty years ago, when the Canadians recognized the necessity for closer union for commercial and government purposes. It is true the federal idea has made some advance in Australasia. A federal council has been in existence for a few years for the purpose of enabling the Australian colonies to confer together on various questions of general import, but the experience of the eight years that have passed since the first meeting of this body has not been satisfactory in view of the want of co-operation of all the Australian dependencies, and of the very limited scope of its powers. The larger project of a federation, including the whole of the island continent, as well as New Zealand, was fully discussed some years ago, in a convention of delegates from all the colonies of Australasia, and a bill was drafted for the formation of a "Commonwealth of Australasia," but the measure has not yet been discussed and adopted by the legislatures of the countries interested, although there is no doubt that the scheme is gaining ground among the people, and no great length of time will elapse before we see its realization. In

South Africa, which Mr. Lucas has well described, in his introduction to his edition of Sir George Cornewall Lewis's Government of Dependencies, "as a congeries of British provinces in different stages of dependence on the mother country, intermixed with protected territories and independent states," the federal idea has necessarily taken no practical form, and it is not likely to do so for many years to come, though something has been gained by the establishment of a customs union between some of the political divisions of a great country with enormous possibilities before it.

No doubt the Australian and other delegates who visited Canada took away with them some well-formed impressions of the value of federal union that will have effect sooner or later upon the legislation of their respective countries. Travelling, as many of them did, over the Dominion, from the new and flourishing city of Vancouver, on the Pacific coast, to the ancient capital of Quebec, on the St. Lawrence, and even to the old seaport of Halifax, on the Atlantic shores of the maritime provinces, they could not fail to be deeply interested by the great wealth of natural resources and the many evidences of national growth which they saw in the rich mineral districts of British Columbia, in the fertile prairies of the Northwest, in the fairly prosperous cities, towns and agricultural settlements of the premier province of Ontario, in the enterprising and handsome city of Montreal, which illustrates the industrial and commercial enterprise of Canada above all other important centres of population, in the abundant fisheries and mines of the maritime provinces, and in the large facilities that are everywhere given for education, from the common school to the university. But the most instructive fact of Canadian development, in the opinion of statesmen, would be undoubtedly the successful accomplishment of a federal union throughout a vast territory, reaching from ocean to ocean, embracing nearly one-half the continent of America, and divided by nature into divisions where diverse and even antagonistic interests had been created during the century that had elapsed between the formation of their separate provincial governments and the establishment of confederation, which has brought them out of their political isolation and given a community of interest to all of British North America, except Newfoundland. This great island, which has been well described "as a huge bastion thrown out into the north Atlantic which, if duly fortified and armed, could be made the Gibraltar of the surrounding seas,"[1] has stood selfishly aloof, and is now suffering under conditions of financial and commercial adversity and political embarrassment which could never have occurred had it, years ago, formed a part of the Canadian confederation; but there is still reason to hope that, after years of isolation, it, too, must ere long yield, like the old province of Canada, to the

[1] The Rev. Dr. Moses Harvey, F.R.S.C., the well-known historian of the island, in Baedeker's Canada, p. 99.

force of circumstances and show a willingness to give completeness to the confederation of the north. Australasian statesmen who desire to see the federal union of their respective colonies consummated might well reflect that to them the task is much easier of accomplishment than has been the case with Canada, since Australia has not to encounter those national and sectional difficulties which have always, from the outset, perplexed and hampered Canadian public men. The history of the Canadian union for the twenty-seven years since 1867 is one which the Australian communities might well study with profit, since it shows the successful results of statesmanship directed to the attainment of a great public end—the removal of sectional and national jealousies, and the creation of a broad Canadian sentiment from one end of the confederation to the other. Though many difficulties undoubtedly intervene in the way of so desirable a national end, yet no one will deny that on the whole the results have been favourable, and make Canadians sanguine for the future, despite the predictions of political pessimists. If the Australasian and South African delegates learned nothing more than this by their visit to Canada, their respective colonies must be very soon the gainers.

III.

But it is not my intention to dwell any longer on this interesting and influential assemblage of colonial representative statesmen. My object in this paper is to show some of the sources of the strength of the Canadian federal constitution, as well as those elements of weakness which are inherent in every system of federation, however carefully devised. In the course of this series I shall make comparisons between the federal system of the Dominion and that proposed by the convention of 1891 for the Commonwealth of Australia. Such a review should have some interest for Australians who are halting in the way of federation, but also for all Englishmen who are anxious to study the evidences of colonial development throughout the empire.

But before I proceed to show some of the experiences of Canada for more than a quarter of a century in the working out of the federal union under conditions of much difficulty, I shall first contrast in parallel columns the leading features of the Canadian system of government with those in the draft of the constitution proposed for the Australian federation. In this way my readers will be able to form an intelligible idea of the principles which lie at the basis of the Canadian system, as well as of those political ideas which have most influence among the statesmen of the Australasian dependencies at this very important period of their history, when they are hesitating between colonial isolation and national strength. I do not propose, however, to take up and review *seriatim* all those features of federation which are summarized below, but simply to

dwell on those experiences of Canada and those details of the Australian bill which will be most useful to the students of federal institutions.

CANADA.	AUSTRALIA.
NAME.	NAME.
The Dominion of Canada.	The Commonwealth of Australia.
HOW CONSTITUTED.	HOW CONSTITUTED.
Of provinces.	Of states.
SEAT OF GOVERNMENT.	SEAT OF GOVERNMENT.
At Ottawa until the queen otherwise directs.	To be determined by the parliament of the commonwealth.
EXECUTIVE POWER.	EXECUTIVE POWER.
Vested in the queen.	Vested in the queen.
Queen's representative, a governor-general, appointed by the queen-in-council.	Queen's representative, a governor-general, appointed by the queen-in-council.
Salary of governor-general, £10,000 sterling, paid by dominion government, alterable by the parliament of Canada.	Not less than £10,000, paid by commonwealth, fixed by parliament from time to time, not diminished during tenure of a governor-general.
Ministers called by governor-general to form a cabinet, first sworn in as privy councillors, hold office while they have the confidence of the popular house of parliament, in accordance with the conventions, understandings and maxims of responsible or parliamentary government.	Same—only for "privy councillors" read "executive councillors."
Privy councillors hold, as the crown may designate, certain departments of state, not limited in name or number, but left to the discretionary action of parliament. Such heads of departments must seek a new election on accepting these offices of emolument.	Executive councillors administer such departments as governor-general from time to time establishes, need not be re-elected on accepting office. Until other provision is made by parliament, number of such officers who may sit in parliament shall not exceed seven.

COMMAND OF MILITARY AND NAVAL FORCES.	COMMAND OF MILITARY AND NAVAL FORCES.
Vested in the queen.	In the queen's representative.
PARLIAMENT.	PARLIAMENT.
The queen.	The queen.
Senate.	Senate.
House of commons.	House of representatives.
Session once at least every year.	The same.
Privileges, immunities and powers held by senate and house of commons, such as defined by act of the parliament of Canada, but not to exceed those enjoyed at the passing of such act by the commons house of parliament of Great Britain.	Such as declared by the parliament of the commonwealth, and until declared such as are held by the commons house of parliament of Great Britain at the date of the establishment of the commonwealth.
Senate composed of twenty-four members for each of the three following divisions: (1) Ontario, (2) Quebec, and (3) Maritime Provinces of Nova Scotia, New Brunswick and Prince Edward Island. Other provinces to be represented under the constitution, but the total number of senators shall not at any time exceed seventy-eight. Senators appointed by the crown for life, but removable for certain disabilities.	Senate composed of eight members from each state, chosen by the houses of parliament of the several states for six years, one-half of the number retiring every third year.
Speaker of the senate appointed by the governor-general (in council).	President of the senate elected by that body.
Fifteen senators form a quorum until parliament of Canada otherwise provides.	One-third of whole number of senators form a quorum until parliament of commonwealth otherwise provides.
Non-attendance for two whole sessions vacates a senator's seat.	Non-attendance for one whole session vacates a senator's seat.
Members of house of commons, elected every five years, or whenever parliament is dissolved by the governor-general.	Every three years.
No property qualification.	Same.

Qualification of electors for members of house of commons as provided by parliament—at present a uniform franchise based on property and income under a dominion statute.	Qualification of electors for members of the house of representatives as prescribed by the law of each state for electors of the more numerous house of the parliament of the state.
A fresh apportionment of representatives to be made after each census, or not longer than intervals of ten years.	Same.
Speaker of house of commons elected by the members of the house.	Same.
Quorum of house of commons twenty members of whom the speaker counts one.	Quorum of house of representatives—one-third of the whole number of members, until otherwise provided by parliament.
No such provision.	Member vacates his seat when absent, without permission, for one whole session.
No such provision.	Parliament to be called together not later than thirty days after that appointed for return of writs.
Allowance to each member of senate and commons $1.000, for a session of thirty days, and mileage expenses, ten cents a mile going and returning. Not expressly provided for by constitution but by statute of parliament from time to time.	Allowance of £500, to members of both houses until other provision is made by parliament.
Canadian statutes disqualify contractors and certain persons holding office or receiving emoluments or fees from the crown sitting in parliament.	Same classes disqualified in the constitution.
Each house determines the rules and orders necessary for the regulation of its own proceedings; not in the constitution.	The constitution has a special provision on the subject.
MONEY AND TAX BILLS.	MONEY AND TAX BILLS.
The same.	Money and tax bills can only originate in the house of representatives.

Same by practice.	The senate can reject, but not amend, taxation or appropriation bills.
Not in Canadian constitution.	The senate may return money and appropriation bills to the house of representatives, requesting the omission or amendment of any provision therein, but it is optional for the house to make such omissions or amendments.
LEGISLATIVE POWERS OF THE PARLIAMENT OF THE DOMINION.	LEGISLATIVE POWERS OF THE PARLIAMENT OF THE COMMONWEALTH.
Respective powers of the federal parliament and provincial legislatures, enumerated and defined in the constitution; the residuum of power rests with the central government in relation to all matters not coming within the classes of subjects by the British North America Act assigned exclusively to the legislatures.	The legislative powers of the federal parliament are alone enumerated, and the states expressly retain all the powers vested in them by their respective constitutions at the establishment of the commonwealth as to matters not specified as being within the exclusive jurisdiction of the federal parliament.
THE PROVINCES.	THE STATES.
Legislatures may alter provincial constitutions except as regards the office of lieutenant-governor.	Constitutions may be altered under the authority of the parliaments thereof.
Lieutenant-governors appointed by the governor-general-in-council, and removable by him within five years only for cause assigned and communicated by message to the two houses of parliament.	The parliament of a state may make such provisions as it thinks fit as to the appointment of governor of a state, and as to the tenure of his office and his removal.
Not in the constitution, but provided for by statutory enactments of parliaments and legislatures.	A member of the senate or house of representatives cannot be chosen as a member of the parliament of a state.
Acts of the provincial legislatures may be disallowed by the governor-general-in-council one year after their receipt.	When a law of the state is inconsistent with one of the commonwealth, the latter shall, to the extent of the inconsistency, be invalid.
Education within exclusive jurisdiction of the provinces, but with	No special provisions in the constitution, education being one of the

conditions for the maintenance and protection of rights and privileges of religious bodies in a province with respect to denominational schools.	subjects exclusively within the powers of the state parliaments, under the clause leaving them in possession of all powers not expressly given to the federal parliament.
The federal parliament can alone impose duties or taxes on imports.	A state shall not impose any taxes or duties on imports except such as are necessary for executing the inspection laws of a state, and such laws may be annulled by the parliament of the commonwealth.
Not in the Canadian constitution, but the regular constitutional practice.	All communications that a state may deem it expedient to make to the queen in parliament shall be made by the governor-general, and the queen's pleasure shall be made known by him.
Similar power.	The parliament of the commonwealth may from time to time admit new states, and make laws for the provisional administration and government of any territory surrendered by any state to the commonwealth, or of any territory placed by the queen under the commonwealth, or otherwise acquired by the same.
THE JUDICIARY.	THE JUDICIARY.
Same in Canada.	The parliament of the commonwealth can establish a supreme court and other courts for the commonwealth; the judges to be appointed by the governor-general, to hold office during good behaviour, not to be removed except upon an address of both houses of parliament, and to receive such salary as may be fixed by the parliament, but so that the salary paid to any judge shall not be diminished during his continuance in office.
No such provision with respect to diminution of salary during tenure of office.	

Similar provisions, by statutory enactments of dominion parliament.	These courts can adjudicate in cases arising out of the constitution, or controversies between states, or in which the commonwealth is a party.
No such provision in the constitution, but appeals in civil—though not in criminal—cases are allowed by virtue of the exercise of the royal prerogative, from provincial courts as well as from the supreme court of Canada to the queen-in-council; *i.e.*, to the judicial committee of the privy council, in practice.	Appeals heretofore allowed from the highest court of final resort of any state to the queen-in-council to be hereafter heard and determined by the supreme court of Australia, and its judgment to be final and conclusive.
Not in the constitution, but a constitutional right of Canada as a dependency of the empire.	An appeal to the queen-in-council allowable in any case in which the public interests of the commonwealth, or of any state, or of any other part of the queen's dominions are concerned.
Judges of the superior and county courts in the provinces (except those of probate in New Brunswick, Nova Scotia and Prince Edward Island) appointed by the governor-general-in-council, and removable only by the same on the address of the two houses of parliament. Their salaries and allowances are fixed by the parliament of Canada.	Judges in the states, appointed and removable under existing state constitutions which the state parliaments can change at will.
The provinces have jurisdiction over the administration of justice in a province, including the constitution, maintenance and organization of provincial courts, both of civil and criminal jurisdiction, and including the procedure in civil matters in those courts.	Similar powers in the states.
The enactment and amendment of the criminal law rests with the dominion parliament.	With the states.

The enactment and amendment of all laws relating to property and civil rights rest with the provinces.	With the states.
TRADE AND FINANCE.	TRADE AND FINANCE.
Customs and excise, trade and commerce, within exclusive jurisdiction of dominion parliament.	The parliament of the commonwealth to have sole power to impose uniform duties of customs and excise, and to grant bounties upon goods when it thinks it expedient. As soon as such duties of customs are imposed, trade and intercourse throughout the commonwealth, whether by internal carriage or ocean navigation, to be free.
The dominion government can veto any such unconstitutional law.	The parliament of the commonwealth may annul any state law interfering with the freedom of trade or commerce between the different parts of the commonwealth, or giving preference to the ports of one part over those of another.
The power of direct taxation is within the jurisdiction of both dominion parliament and provincial legislatures, the one for dominion and the other solely for provincial purposes.	Direct taxation may be imposed by the commonwealth and by each state within its own limits—but the power of taxation, when exercised by the commonwealth, must be uniform.
Both dominion and provincial governments have unlimited borrowing power under the authority of parliament and legislatures.	Same is true of commonwealth and states.
Certain money subsidies paid annually to the provinces for the support of their governments and legislatures.	The revenue of the commonwealth from customs and other taxes is applied in the first instance to the payment of the expenses of the commonwealth and the surplus returned to the several states in proportion to the amount of revenue raised therein respectively, subject to certain special conditions in the constitution with respect to duties of customs and excise and the proceeds of direct taxes.

Canada is liable for amount of the debts and liabilities of the provinces existing at the time of the union, under the conditions and terms laid down in the constitution.	The parliament of the common wealth may consolidate or take over state debts by general consent, but a state shall indemnify the commonwealth and the amount of interest payable in respect to a debt shall be deducted from its share of the surplus revenue of the commonwealth.
IMPERIAL CONTROL OVER DOMINION LEGISLATION.	IMPERIAL CONTROL OVER AUSTRALIAN LEGISLATION.
Bills may be reserved by the governor-general for the queen's pleasure, and her majesty-in-council may within two years after receipt of any dominion act disallow the same.	Same. State legislation is subject to similar power of disallowance by queen-in-council, subject of course to the provisions of the constitution in matters under the control of the commonwealth, like customs duties, and trade and commerce.
No such provision.	The governor-general may return any "law" presented to him for the queen's assent and suggest amendments therein, and the houses may deal with them as they think fit.
Recommendation of crown required before initiation of a money vote.	Same.
AMENDMENTS TO THE CONSTITUTION.	AMENDMENTS TO THE CONSTITUTION.
By the imperial parliament on an address of the houses to the queen.	The constitution can be amended only by consent of a majority of the senate and house of representatives, and with the approval of a majority of the states, represented in conventions chosen by the electors of the several states ; if the people of the states, who so approve, constitute a majority of the people of the commonwealth, the proposed amendments shall be submitted to the governor-general for the queen's assent.

IV.

Briefly stated the strength of the constitution of Canada largely rests on the following conditions:

1. An enumeration of the respective powers of the federal and provincial governments, with the residuum of power expressly placed in the central or general government.

2. A permanent and non-elective executive in the person of the reigning sovereign of England who is represented by a governor-general, appointed for five or six years by the queen-in-council to preside over the administration of Canadian affairs, and consequently elevated above all popular and provincial influences that might tend to make him less respected and useful in his high position.

3. The existence of responsible or parliamentary government after the English model.

4. The placing of the appointment of all judges in the dominion government, and their removal only on the address of the two houses of the dominion parliament, which address can only be passed after full inquiry by a committee into any charges formally laid against a judge.

5. The reference to the courts of all cases of constitutional conflict or doubt between the Dominion and the Provinces that may arise under the British constitutional law or the British North America Act of 1867.

These are the fundamental principles on which the security and unity of the federal union of Canada rest, and I shall now proceed to show briefly the reasons for this emphatic opinion.

As the queen, or reigning sovereign, who is made the executive authority over Canada by the constitution, cannot be present in the Dominion to discharge her constitutional functions, the British North America Act provides for the presence, as her representative, of a governor-general, who has in point of dignity the position, though he has not the title or all the regal attributes of a viceroy. Canadians have never raised a claim, as some of the Australian colonists have done, that they should be always consulted in the choice by the sovereign of this important public functionary, nor have Canadians ever demanded the privilege of electing from their own statesmen their governor-general, as was actually proposed in the Australian convention.

Sir George Grey of New Zealand, whose democratic tendencies were constantly *en évidence* in the debates of the convention, moved an amendment with the object of testing the feeling as to an elective governor, but it was supported by only three votes against five in the negative. Sir John Downer, whose speeches were always distinguished by much constitutional knowledge and statesmanlike breadth of view, said with truth: "I would ask in what position would the governor-general be when he is elected? If he is elected by the voice of the people, does the hon. gentle-

man assert that history will not repeat itself, and that the governor-general will not assume a position something like that of the president of the United States, so that the cry amongst political parties will be 'Who is for the president, and who is against him?'" It would be assuredly an unfortunate thing for Australia, as well as for Canada, were the governor-generalship to become the object of the contentions of political parties and factions, like the presidency or governorships of the United States.

The elective principle has never been applied in the constitutional practice of Canada to administrative, executive or judicial officers—despite their close neighbourhood to the United States,—but has been confined, in accordance with the English system which obtains throughout the empire, to representatives in parliament or in the municipal councils of the country. Consequently Canadians have been spared the excitement and expense that have followed the adoption of the elective principle in the United States, where the president of the nation and the governors of the forty-four states are elected for short terms of office—the former for four years and the latter from one to four years. Removed from all political influences, since he does not owe his appointment to any Canadian party, exercising his executive powers under the advice of a constitutional ministry who represent the majority in the legislature, representing what Bagehot would call the dignified part of the constitution, the governor-general is able to evoke the respect and confidence of all classes of the people, and not only to exercise a decided influence on the administration of public affairs by consultation with his ministers, under the unwritten but well understood conventions and rules of the constitution, but also to elevate the tone of public opinion by his public speeches on those numerous occasions when he is called upon to address audiences on questions of general import relating to education, literature and science, and other matters not mixed up with party politics but having an intimate connection with the development and prosperity of the country. By his hospitalities as head of Canadian society, he is able to bring men of all political parties together in social intercourse, and do much to assuage the bitterness of faction in a country where the current sets so steadily towards democracy. Were the governor-general elected, he could not possibly occupy the same vantage ground, since he would be necessarily the leader of his party, like an American president—the subject of the sharp and unfair criticism of his political opponents. He would again occupy the position the governor-general practically held for over fifty years in Canadian political history before the establishment of responsible government, when he was too often personally brought into the arena of political discussions and conflict, and made a target of the abuse of the popular leaders, since there were no ministers sitting in parliament to assume full responsibility for the acts of the executive authority.

The history of the old thirteen colonies is full of instances of the unpopularity of royal governors, who were constantly in antagonism to the people's representatives on account of their arrogant exercise of executive power and interference with strictly colonial affairs, and who did much consequently to create that sentiment against the parent state which eventually led to separation. In Canada, too, the constant interference of the imperial government—really of a few officials in Downing-street—in matters which should have been settled in Canada, the obstinacy and want of judgment on the part of some governors, the arrogance and selfishness of officials who owed no responsibility to the legislature, the indiscretions of the appointed legislative councils, the ignoring of the just claims of the people's representatives to control the public moneys and expenditures, led also to a popular outbreak, which has been generally called a rebellion, although it never assumed very large proportions, even in the French province of Lower Canada, but was confined to a very limited area and an insignificant faction, whilst in the English province of Upper Canada it was almost contemptible as respects the standing and number of the people immediately engaged in it.

V.

It was the concession of responsible government, in the period from 1840 to 1854, to the provinces that now compose the Dominion of Canada, that relieved the Canadians of the personal rule of governors and officials, and removed all reason for the discontent that led to the ill-advised insurrections of 1837 and 1838. It was paternal government exercised too often without judgment or knowledge of the wishes of the colonial communities in America, that led to the independence of the old colonies, as well as to the Canadian outbreaks of over half a century ago. It is local self-government, in the fullest significance of the term, that has been for fifty years the source of the content and prosperity of the Canadian people. From 1792, when the two provinces of Upper and Lower Canada were formed out of the old province of Quebec, that extended from the Gulf of St. Lawrence to the western lakes, down to 1841, when these two sections were re-united under one government in accordance with the recommendation of Lord Durham, the public men of Canada learned many valuable political lessons from the very trials and struggles of the country for larger political rights. When responsible government was at last conceded by England, it had become a necessity of the political situation in the provinces; the public men had been fully educated in its principles and were ready to work them out with as much intelligence as if they had been taught in the legislative halls of the parent state. Step by step the provinces were relieved from all those commercial and political restrictions which the imperial government had regarded as necessary to

a condition of colonial pupilage, until by a quarter of a century after the union of 1841, these committees possessed full control over their trade and commerce, and were able even to enter into a treaty of reciprocity with the United States that provided for a free interchange of the natural products of the respective countries. The customs, the post offices, and other matters were handed over to the jurisdiction of the provinces, and the English government exercised only the supervision over Canada that is the constitutional and necessary sequence of imperial supremacy. When the legislative union of 1841 became unequal to the political conditions of the Canadas, and it was expedient to afford greater facilities for commercial intercourse between the provinces, give unity to the isolated British American communities that stretched from the Atlantic to Lake Superior, establish additional guarantees for the protection of the rights and privileges of the French Canadian nationality, and at the same time erect a barrier against the ambition of the great federal republic that had just subdued the south, the statesmen of British America assembled in conference and gave expression to the popular sentiment in favour of a larger sphere of political action. They succeeded in forming a federal union, which originally consisted of only four provinces—Nova Scotia, New Brunswick, Ontario and Quebec,—but extended its authority, in the course of a few years, over the fertile island of Prince Edward in the east, added an immense territory in the northwest, out of which was immediately carved a new province, and finally reached the Pacific shores by the addition of British Columbia, with its stupendous range of mountains, and the picturesque island of Vancouver, placed as a sentinel to guard the approaches to the western shores of a Dominion whose laws are executed over nearly half the continent.

VI.

The federal union was the inevitable sequence of the self-government that was the immediate result of the liberal colonial policy adopted towards the colonies soon after the present queen ascended the throne, and with which the names of Durham, Russell, Grey and Gladstone must be always associated in the history of the empire. The constitution of Canada, which is known as the British North America Act of 1867—embodying the resolutions of the Quebec conference of 1864—only enlarged the area of political sovereignty of the provinces, and gave greater scope to their political energy, already stimulated for years previously by the influence of responsible government. The federal constitution has left the provinces in the possession of the essential features of that local government which they had fairly won from the parent state since Acadia and Canada were wrested from France, and representative institutions were formally established throughout British North America

In every province there is a lieutenant-governor appointed by the dominion government, who, in regard to this officer, occupies that relation to the provinces which was formerly held by the imperial authorities. This officer is advised by an executive council chosen, as for forty years previously, from the majority of the house of assembly, and only holding office while they retain the confidence of the people's representatives. In the majority of the provinces there is only one house—the elected assembly. The legislative councils that assisted before 1867 have been abolished in all the legislatures except those of Quebec and Nova Scotia, and in the latter the example of the majority will soon be followed. The upper houses had become to a great extent expensive and almost useless bodies, since they were the creation of the respective governments of the day—who too often considered only the claims of party in their appointments—with no responsibility to the people, rarely initiated important legislation, and had no legislative control over the purse strings of the provinces, and, at the best, only revised the legislation of the lower house in a perfunctory sort of way. It is questionable, however, whether it would not have been wiser, in view of the hasty legislation that may be expected from such purely democratic bodies as the lower houses are becoming under the influence of an extended franchise—manhood franchise existing in nearly all the provinces, including the great English province of Ontario—to have continued the English bicameral system, which still exists in the great majority of parliamentary bodies throughout the world,[1] and which even the republican neighbours of Canada have insisted on, in every stage of their constitutional development, as necessary to the legislative machinery of the nation and of every state of the union. It would have been much better to have created an upper house, which would be partly elected by the people and partly appointed by the crown, which would be fairly representative of the wealth, industry and culture of the country—the last being insured by university representation. Such a house would, in the opinion of those who have watched the course and tendency of legislation since the abolition of these upper chambers, act more or less as legislative break-

[1] "The bicameral system has met the approval of most of the leading political writers [Victor Tiszot, "Unknown Hungary," I. 134], and is realized in practice by the legislatures of the principal countries. Legislative bodies with a single chamber are common in cities, in departmental, provincial and county councils. Many of the smaller American cities, and some of the larger, have a council of one chamber, but every American state legislature has two houses. The unicameral bodies fall into three or four main groups: the parliaments of the minor states of southeastern Europe, Servia, Bulgaria and Greece; the congresses of the states of Central America, Nicaragua excepted, compose another group; the landtags of the Austrian crown lands are one-chambered, and so are nearly all the diets of the minor German states, excepting those of the free cities." See "The Representative Assemblies of To-Day," by E. K. Alden; Johns Hopkins University Studies, 1893.

waters against unsound legislation and chimerical schemes. As it was, however, these second chambers had lost ground in the public estimation through their very inherent weakness, representing as they did, too often, merely the favours of government and the demands of party, and not many words of dissent were heard against their abolition. No doubt, economical considerations also largely prevailed when it was a question of doing away with these chambers. No doubt, too, when these bodies disappeared from the political constitutions of the provinces, some importance was given to the suggestion that the veto given by the federal law to the dominion government over the legislation of the provinces, did away to a large extent with the necessity for a legislative council, for its *raison d'être,* if one may so express it. But, in the practical working of the federal union, the vehement and persistent assertion of "provincial rights," and the general trend of the decisions of the courts to whom questions of jurisdiction have been referred, have tended rather to give a weight and power to the provincial communities that was not contemplated by the leading architects of the federal framework; certainly not by the late Sir John Macdonald, who believed in a strong central government, dominating the legislation and even the administration of the provinces, whenever necessary for reasons of urgent dominion policy. But the powers, granted in express terms or by necessary implication to the provincial authorities, take so wide a range, and the several provincial governments, from the inception of the union, have been so assertive of what they consider their constitutional rights, that it has not been possible to minimize their position in the federation. As it is now, the governments of the several provinces legislate on subjects which, though local and provincial in their nature, are intimately connected with the rights of property, and all those personal and public interests that touch men and women most nearly in all the relations of life,—far more so, necessarily, than dominion legislation, as a rule. In view of such a condition of things, the veto of the Dominion is now rarely exercised—in fact, only in cases where an act is clearly unconstitutional on its face, and any attempt to interfere with provincial legislation on other ground than its unconstitutionality or illegality, will be strenuously resisted by a province. In view then of the position of the veto—a subject to which I shall again refer—there are not a few thinkers who regret that there are not still in all the provinces an influential upper house, able, from the nature of its constitution and the character and ability of its *personnel*, to initiate legislation and exercise useful control over the acts of a lower house now perfectly untrammelled, except by the courts, when legislation comes before them in due course of law. The consequences of the present system must soon show themselves one way or the other. I admit that these fears may be proved to have no foundation

as the union works itself out. On the face of it, however, there is a latent peril in a single chamber, elected under most democratic conditions, liable to fluctuation with every demonstration of the popular will, and left without that opportunity for calm, deliberate second thought that a second chamber of high character would give at those critical times which must occur in the history of every people.

VII.

In the constitution of the dominion government, however, the British North America Act has adhered to the lines of the British system, since it provides for an advisory council of the governor-general, chosen from those members of the privy council of Canada who have the confidence of the house of commons; for a senate of nearly eighty members, appointed by the crown from the different provinces; for a house of commons of two hundred and fifteen members, elected by the people of the different sections on a basis of population, and on the condition that the number of members given to Quebec by the constitutional act shall not be disturbed. The growth of democratic principles is seen in the very liberal dominion franchise, on the very threshold of manhood suffrage, with limitations of citizenship and residence. The members of the senate must have a very small qualification of personal and real property, and are appointed for life. The remarkably long tenure of power enjoyed by the Conservative party—twenty-four years since 1867—has enabled it to fill the upper house with a very large numerical majority of its own friends; and this fact, taken in connection with certain elements of weakness inherent in a chamber which has none of the ancient privileges or prestige of a house of lords, long associated with the names of great statesmen and the memorable events of English history, has in the course of years created an agitation among the Liberal party for radical changes in its constitution which will bring it more in harmony with the people, and give it a more representative character, and at the same time increase its usefulness. This agitation has even proceeded so far as to demand the abolition of the house, but it is questionable if this movement is sustained to any great extent by the intelligence of the country. On the contrary, public opinion, so far as it has manifested itself, favours the continuation of the second chamber, on conditions of a larger usefulness, in preference to giving complete freedom to the democratic tendencies of an elective body—tendencies not so apparent at present, but likely to show themselves with the influx of a large foreign population and the adoption of universal suffrage, which is looming up in the near future. The senate, as at present composed, contains many men of ability, and cannot be said to display a spirit of faction, despite its preponderance of one party, while for two years back its leaders have seen the necessity for initiating in this chamber a large number of important

public measures. The movement for a remodelling of the senate, however, has not yet taken any definite shape, and is not likely to do so so long as the present Conservative government remains in power, although the writer is one of those who believe that it ought soon to be strengthened by giving it a more representative character, on some such plan as has been suggested in the case of legislative councils in the provinces. Of course no constitutional changes can be made in the body except on an address of the two houses to the crown. The British North America Act does not allow an unrestricted use of the royal prerogative in case of a deadlock between the two houses, since it provides for the appointment of only six senators at the most. When, some years ago, the Liberal government attempted to make use of this constitutional provision, they were rebuked by the imperial authorities on the ground that the circumstances did not justify an addition to the senate at that time. With this precedent before them, it will be always difficult for a government to increase their strength in this way.

With experience of the Canadian senate and their own legislative councils before them the framers of the proposed Australian federation have followed the example of the United States and provided for a senate whose members are elected for six years by the legislatures of the colonies—or parliaments of the Australian states, as they are more ambitiously called in the bill. The constitutional provisions that govern the house of lords, and the Canadian senate with respect to the initiation or amendment of taxation, and annual appropriation bills are fully recognized in the Australian draft. Some enlargement of power is, however, given to the new house in the case of money bills and it is permitted at any stage to return any proposed law, which they may not amend, with a message requesting the omission or amendment of any items or provisions therein. This practice seems to have been followed for some years in South Australia, but in introducing it into their proposed constitution the convention appears to have been largely influenced by a hope that it would give the upper house greater power and also some resemblance to the senate of the United States. But they have forgotten that that great body has long wielded the three elements of authority—executive, legislative and judicial. It goes into executive session on treaties and appointments made by the president, acts as a court of impeachment for the president and high functionaries, and exercises the supreme legislative power of directly amending money bills. Until the popular assemblies in Australia are able or willing to give such sovereign powers to an upper house, it is idle to talk of comparisons with the senate of an *independent* federal republic.

No doubt the members of the Australian convention hope that a senate with a longer tenure of power, and an indirect method of popular election, will be to a considerable degree more conservative in its legisla-

tion than a more democratic lower house elected on a short term of three years—one more than the house of representatives of congress, and two less than the house of commons of Canada. Of course, some of the Australian colonies have had experience of an elective upper house, and it is somewhat curious that while they continue that system in the proposed federal union, the Canadians have returned to an appointed house as preferable to the one they had before 1867—even so thorough a radical as the late George Brown, then leader of the Liberal party, earnestly urged the change in the Quebec convention. When we consider the character of the agitation against upper houses, we see that, in the nature of things, democracy is ever striving to remove what it considers barriers in the way of its powers and will. An upper house, under modern political conditions, is likely to be unpopular with the radical and socialistic elements of society, unless it is elective. As the Australians are obviously admirers of the American federal constitution, from which they copy the constitution of their upper chamber, we direct their attention to the fact that an agitation has already commenced and made much headway in the United States, to change the present indirect method of electing senators, and to give their election directly to the people. It says something, however, for the conservative and English instincts of the Australians that they have not yielded to the full demands of democracy, but have recognized the necessity of an upper house in any safe system of parliamentary government.

VIII.

We see accordingly in the dominion and provincial constitutions the leading principles of the English system—a permanent executive, responsible ministers, and a parliament or legislature. The central government follows directly the English model by continuing the upper house, but the majority of the provinces vary from all other countries of English institutions by abolishing the legislative councils. In the enumeration of the legislative powers respectively given to the dominion and provincial legislatures, an effort was made to avoid the conflicts of jurisdiction that so frequently arose between the national and state governments of the federal republic. In the first place we have a recapitulation of those general or national powers that properly belong to a central authority, such as customs and excise duties, regulation of trade and commerce, militia and defence, post office, banking and coinage, railways and public works "for the general advantage," navigation and shipping, naturalization and aliens, coast service, fisheries, weights and measures, marriage and divorce, penitentiaries, criminal law, census and statistics. On the other hand, the provinces have retained control over municipal institutions, public lands, local works and undertakings, incorporation

of companies with provincial objects, property and civil rights, administration of justice, and generally "all matters of a merely local and private nature in the province." It will be remembered that the national or general government of the United States is alone one of enumerated powers, whilst the several states have expressly reserved to them the residuum of power not in express terms or by necessary implication taken away from them. In their anxiety to avoid the sectional and state difficulties that arose from these very general provisions and to strengthen by constitutional enactment the general government of the Dominion, the framers of the British North America Act placed the residuary power in the parliament of Canada—in the words of the law that parliament is allowed "to make laws for the peace, order and good government of Canada in relation to all matters not coming within the classes of subjects by this act assigned exclusively to the legislatures of the provinces."

But despite the earnest effort that was made by the Canadians to prevent troublesome questions of jurisdiction too constantly arising between the general and provincial governments, the courts have been steadily occupied for a quarter of a century in adjusting the numerous constitutional disputes that have arisen in due course of law under the union act. Five large octavo volumes of nearly four thousand pages now contain the decisions that have been recorded by the judicial committee of the privy council of England and the courts of Canada. Discussions are frequently arising in the legislative bodies on the varied interpretation that can be given to the constitution on these very points of constitutional procedure and jurisdiction which the framers of the federal union thought they had enumerated with great care. But it is in this very reference to the courts that the strength of a written instrument of federal government lies. In Canada, as in all other countries inheriting English law, there is that great respect for the judiciary which enables the people to accept its decisions when they would look with suspicion on the acts of purely political bodies. We need look only to the experience of the United States to test the value of judicial opinions on constitutional issues. The following remarks of a very judicious writer, Professor Dicey,[1] may be appropriately quoted in this connection:

"The main reason why the United States have carried out the federal system with unqualified success is that the people of the union are more thoroughly imbued with constitutional ideas than any other existing nation. Constitutional questions arising out of either the constitutions of the several states or the articles of the federal constitution are of daily occurrence and constantly occupy the courts. Hence the people become a people of constitutionalists; and matters which excite the

[1] "The Law of the Constitution," 3rd ed., p. 167.

strongest possible feeling—as, for instance, the right of the Chinese to settle in the country—are determined by the judicial bench, and the decision of the bench is acquiesced in by the people. This acquiescence or submission is due to the Americans inheriting the legal notions of the common law; that is, of the most legal system of law, if the expression may be allowed, in the world."

These remarks apply with full force to the Canadian people, who look to the courts for the only satisfactory solution of many difficulties in the working of their constitution. This judicial interpretation of written constitutions is not new in the experience of British countries, but is coincident with the creation of colonies or provinces in America. The privy council of England was always the supreme court of appeal for the dependencies of the crown, to whom could be referred those questions of law that arose in the old colonies as to the construction to be put on their charters of government. An American writer[1] has very clearly explained, in the following paragraph, the principles on which the courts have always interpreted written instruments or charters of government:

"In deciding constitutional questions, the supreme court [of the United States, and Canada as well] interprets the law in accordance with principles that have long governed the courts of England. For when an English judge finds conflict between an act of parliament and a judicial decision, he sets aside the decision, as of an authority inferior to that of the act; and if two parliamentary acts conflict, the earlier is set aside as superseded by the later one,—the court interpreting the law simply by determining what *is* law as distinguished from what *is not*. The range of this English usage was somewhat amplified in the colonies, owing to the fact that, instead of parliament, the colonial courts had legislatures to deal with, which acted, in most instances, under written charters limiting their powers, as also under the general domination of the home government. The colonial judiciary did not hesitate to adjudge a local statute invalid if its enactment could be shown to have exceeded powers conferred by charter; and the privy council, in the capacity of a supreme court for the colonies, decided in like manner conflicts between laws. When state constitutions succeeded to the charters, the process was continued by the state courts in cases showing conflicts between statutes and the new constitutions judicially interpreted. The national government, with a constitution of its own, created an element of superior law, in conflict with which not only state but national enactments of lesser authority are nullified. All that the judiciary does in England, and all that it does in the states, and in the courts of the United States [and we may add Canada], is to uphold the authority of what it decides to be

[1] Dr. Stevens's "Sources of the Constitution of the United States," pp. 191, 192.

the higher law, as against all lesser laws or judicial decisions. What, therefore, has been supposed to be the most unique feature of the American supreme court, is really only another adaptation from the past, and rests upon colonial and English precedents."

IX.

Cases involving constitutional questions may be tried in any of the superior courts of the provinces, with the right of appeal to the federal supreme court, and finally, under certain limitations, to the English privy council. The judgments of the judicial committee have been always received with the respect due to the learning of so high a court, and, on the whole, have given satisfaction, though there have been occasions when the lay, and even the legal mind, has been a little perplexed by somewhat contradictory decisions, arising from the difficulty of the judges to comprehend what are largely provincial issues. For instance, in cases relating to the sale of intoxicating liquors, the jurisdiction was at first declared to be in the dominion government, but subsequently in the provincial authorities, with the obvious result of leaving a troublesome issue more complicated than ever. The tendency of the judgments of the courts has been towards strengthening the provincial entities and minimizing, to a certain extent, the powers of the central authorities. For instance, the judicial committee have gone so far as to lay it down most emphatically:

"That when the imperial parliament gave the provincial legislatures exclusive authority to make laws on certain subjects enumerated in the act of union, it conferred powers not in any sense to be exercised by delegation from, or as agents of, the imperial parliament; but authority as plenary and as ample within the limits prescribed by the section 92, as the imperial parliament, in the plenitude of its power, possesses and could bestow."

The consequence has been the very opposite of the decisions, as a whole, of the supreme court of the United States, where the late Chief Justice Marshall did much to mould the constitution in the direction of enlarging the scope of the powers expressly given to the national government. It is a question whether the judicial committee, however ably constituted, would not find its usefulness increased by the membership of a great colonial lawyer, who would bring to his duties not only legal acumen and judicial fairness, but "a comprehension of the nature and methods of government which one does not expect from European judges who act within the narrow path traced for them by ordinary statutes." [1]

[1] Professor Bryce in "The American Commonwealth," vol. 2, p. 1. Since this passage was written, the imperial parliament has passed an act providing for the appointment of colonial judges to the committee, but the colonies must provide sal-

As long as this imperial court is composed of men of the highest learning—and it is very rarely this is not the case—it is a positive advantage to the people of Canada and of all the other dependencies of the crown to have its independent decision on constitutional questions of moment. In the Australian convention doubts were expressed as to the necessity of this reference, when the new federation will have a supreme court of its own, but it would be a serious mistake to ask the crown to give up entirely the exercise of a prerogative so clearly in the interests of the empire at large. To quote the apt words of Sir Henry Wrixon:

"At present it is one of the noblest characteristics of our empire that over the whole of its vast area every subject, whether he be black or white, has a right of appeal to his sovereign. That is a grand right and a grand link for the whole of the British empire. But it is more than that. It is not, as might be considered, a mere question of sentiment, although I may say that sentiment goes far to make up the life of nations. It is not merely that, *but the unity of final decision preserves a unity of law over the whole empire.*"

The words we have given in italics are unanswerable, and it is unfortunate, we think, that such arguments did not prevail in the convention to the fullest extent. That body in this, as in other matters, appears to have been largely influenced by a desire to make Australia independent of England as far as practicable, and the majority were only at the last persuaded to adopt a clause providing for a modified reference to the queen-in-council of cases "in which the public interests of the commonwealth, or of any state, or any other part of the queen's dominions are concerned." Probably, however, before the constitution is finally adopted all limitations of this exercise of the royal prerogative in the dependency will be removed.

When we consider the influence of the courts on the Canadian federal union we can see the wisdom of the provision which places the appointment, payment and removal of the federal as well as provincial judges in the hands of the dominion government. It may be said, indeed, that, by the nature of their appointment and permanency of tenure, all the judges of Canada are practically federal, though the organization of the provincial courts rests with the provincial governments. The consequence is, the provincial judges are removed from all the influences that might weaken them were they mere provincial appointments. In the United States the constitution provides for federal judges, whose appointments rest with the president and senate. For many years after

aries adequate to the position, a fact likely to create a difficulty since the amount required will be so far beyond what is paid colonial judges. On the other hand the advantage to the dependencies will be so great that both Canada and Australia should move in the matter.

the formation of the states, the appointment of the state judiciary rested with the governors or the legislatures, or both conjointly, and only one state, Georgia, made them elective. It was the state of New York, among the older states, that really led the way to the election of all judicial officers, from the highest to the lowest, throughout the union. At the present time, out of the forty-four states, thirty elect the judges by a popular vote. The federal judiciary has always held a far higher position in the estimation of the intelligence of the country than the elective judiciary of the states, since its mode of appointment, permanency of tenure and larger scope of duties have given it a positive strength and dignity that the latter, under its inherent conditions of weakness, cannot possibly possess.

It is but just, however, to add that flagrant cases of corruption or impropriety are remarkably rare among the state judiciary despite its election by political and popular influences; the most shameful instances having occurred in the city of New York, where the party machine, under the Tammany control, has always exercised a baneful influence on public morals. The evils of the elective system would have undoubtedly been far greater had not the good sense of the people eventually recognized the necessity of giving a longer tenure of office to the judges, and re-electing them when they have discharged their duties with fidelity. At present the terms of office average ten years throughout the union, a number of the states having extended them to fifteen, fourteen and twelve years. Swift retribution has generally followed such flagrant examples of corruption as those of Barnard, Cardozo and McCunn in New York, under the Tweed régime; and when Judge Maynard, of the Albany court of appeal, whose conduct in reference to election returns had been most discreditable, presented himself in 1893 for a renewal of his term, he was met by a popular majority against him, and was literally, to use an Americanism, "snowed under." Although the evils of an elective judiciary are not so apparent on the surface, it is admitted by American thinkers and publicists, who are not politicians, but can speak their honest opinion, that the system has been most unfavourable to the selection of men of the best ability, and to the exhibition of courage and fidelity in the discharge of their important functions. Judicial decisions have been wanting in consistency, and too constantly fluctuating and feeble. Men of inferior reputation have been able, by means of political intrigue and most unprofessional conduct, to obtain seats on the bench. Confidence in the impartiality of judges is sensibly lessened when it is the party machine that elects, and professional character and learning count for comparatively little. If the interpretation of the constitution had depended exclusively on this state judiciary, the results would have been probably most unfavourable to the stability of the union itself, but happily for its best interests the men who framed the fundamental law

of the republic, wisely provided an appointive federal judiciary, removed from the corrupt and degrading influences of election contests, and made them the chief legal exponents of their written instrument of government. It is, therefore, a happy circumstance for Canada that all its judges are entirely independent of political influences, as well as of the fluctuating conditions of a narrow range of provincialism. As exponents of the constitution, the dominion judiciary has greater elements of strength than the judiciary of the United States, since it is federal from a most important point of view, while that of the latter country is divided between nation and states. In another respect the Canadian government has made a step in advance of their neighbours, with the view of obtaining a reasoned opinion from the higher courts in cases of legal doubt and controversy between the central and provincial governments, and between the provinces themselves. The governor-in-council may refer to the supreme court for hearing and argument important questions of law or fact touching provincial legislation or any other constitutional matter; and the opinion of the court, although advisory only, shall for all purposes of appeal to her majesty-in-council, be treated as a final judgment between the parties. No such provision exists in the case of the federal judiciary at Washington, which can be called upon only to decide controversies brought before them in a legal form, and are therefore bound to abstain from any extra judicial opinions upon points of law, even though solemnly requested by the executive. A similar provision exists in Ontario for a reference to the provincial courts, and the question may be fully argued—a provision that does not exist in the few states of the federal republic where the legislative department has been empowered to call upon the judges for an opinion upon the constitutional validity of a proposed law. Either house of the Canadian parliament may also refer a question of jurisdiction in the case of a private or local bill, but so far the senate alone has availed itself of what might, in many instances, be a useful check on hasty legislation.

I have dwelt at some length on these carefully devised methods of obtaining a judicial and reasoned opinion in cases of constitutional controversy, with the view of showing that they are recognized as the best means of arriving at a satisfactory solution of legal difficulties that cannot be settled in the political arena. The necessity of making the courts in every way possible the arbiters in such cases is clearly shown by the history of the veto given by the British North America Act to the government of the Dominion over the legislation of the provinces. Although the president and the governors of the states may by their veto prevent the passage of any act of congress or of their respective legislatures which they consider objectionable from a constitutional or public point of view, provided there is not a sufficient majority in those bodies—

two-thirds in each house of congress and a majority (generally speaking) in the legislatures—to override that veto, the constitution does not confer upon the executive authority of the nation that sovereign power entrusted to the dominion government, of vetoing the legislation of the states.

Dr. James Bryce[1] tells us that the impression prevailed in the convention of 1787, which framed the constitution of the United States, that the exercise of such a power by the federal authority "would have offended the sentiment of the states, always jealous of their autonomy, and would have provoked collisions with them." This has been the experience of Canada whenever the power has been exercised on grounds of public policy. Collisions, which threatened at one time to be serious, arose between the central government and the province of Manitoba on account of the dominion authority vetoing certain provincial railway acts, in conflict with the obligations which the general government had assumed in connection with the Canadian Pacific Railway—a national work of great importance. The provincial acts were vetoed time and again, but the Manitoba government persisted in re-enacting them, and the difficulty was only settled by the intervention of the dominion parliament, who gave to the Pacific Railway certain privileges in consideration of its consent to the removal of the restrictions that had created the dispute. From these and other cases it is clear that the exercise of the power is viewed with great jealousy, and may at any moment lead to serious complications by creating antagonisms of much gravity between the central and provincial governments. It is now, however, becoming a convention of the constitution that the dominion authorities should not interfere with any provincial legislation that does not infringe the fundamental law; that the only possible excuse for such interference would be the case of legislation clearly illegal or unconstitutional on the face of it, or in direct violation of the original compact or terms on which the provinces entered the union, or dangerous to the security and integrity of the dominion or of the empire. The debates of the Canadian parliament of recent years have shown what an advance has been made in the direction of strengthening provincial autonomy since the early days of the union, when Sir John Macdonald, who would minimize the powers and privileges of the provinces to the extreme point, was bringing the veto in practical operation. It is now deemed the wisest policy to leave as far as possible all questions of constitutional controversy to the action of the courts by the method that the law, as I have already pointed out, provides to meet just such emergencies. In ordinary cases, however, where there is an undoubted conflict with powers belonging to the central government, or where the province has stepped beyond its con-

[1] "The American Commonwealth," vol. i., p. 343.

stitutional authority, the veto continues to be exercised with much convenience to all the parties interested. It must be admitted that on the whole the authorities of the Dominion have exercised this sovereign power with discretion, but it cannot be denied that it may be at any time a dangerous weapon in the hands of an unscrupulous and reckless central administration when in direct antagonism to a provincial government, and it can hardly be considered one of the elements of strength, but rather a latent source of weakness in the federal structure.

X.

No doubt the experience of the Canadians in the exercise of the veto power has convinced the promoters of the proposed federal union of Australia that it would be unwise to incorporate it in their draft of constitution, which simply provides that "when a law of a state is inconsistent with a law of the commonwealth, the latter shall prevail, and the former shall, to the extent of the inconsistency, be invalid." The political government of the federation is given no special authority to act under this clause and declare any "state" legislation unconstitutional by a proclamation of the governor-general, as is done in Canada, but the provision must be simply a direction to the courts, which also in the proposed commonwealth are to have all the legitimate authority that is essential to the satisfactory operation of a federal system.

The only power of veto expressly given to the commonwealth is that of annulling any law or regulation made by any state, or by any authority constituted by any state, having the effect of derogating from freedom of trade or commerce between the different parts of the commonwealth. As a matter of fact, any such state law would be decided unconstitutional, since the regulation of trade and commerce is within the exclusive jurisdiction of the general government of the commonwealth, and consequently the provision in question only states the law more emphatically, and seems in a sense almost supererogatory.

Some of the members of the Australian convention, however, have seen a means of controlling "state" legislation in the following provision:

"5. All references or communications required by the constitution of any state or otherwise to be made by the governor to the queen shall be made through the governor-general, as her majesty's representative in the commonwealth, and the queen's pleasure shall be known through him."

This section was severely criticized by the advocates of "State Rights" in the convention, but it is certainly necessary, unless we are to see the strange spectacle presented at all times of the general and state governments communicating separately with the imperial authorities, who would soon become thoroughly perplexed, while the federation

would constantly find itself plunged into difficulties. By means of one channel of intercourse, however, some order will be maintained in the relations between England and the new federation. It is quite true that the clause does not say, as it was urged by more than one prominent member of the convention, "that the executive authority of the commonwealth shall have the right to veto any bill passed by the different states, or even to recommend her majesty to disallow such bill;" but there is nothing to prevent the governor-general, as an imperial officer, from making such comments in his despatches to the secretary of state for the colonies as he may deem proper and necessary—indeed it is his constitutional duty—when he transmits the acts of the respective "states" to the queen-in-council for approval or disapproval—all such acts continuing to be so referred as at present. Of course the imperial government is not likely to interfere with strictly local legislation any more than they do now; all they ever do is to disallow colonial legislation that conflicts with imperial acts or imperial obligations. It is quite clear that this provision is for the advantage of the empire at large and necessary for the unity and harmony of the federation. Some means must exist for the instruction of the imperial authorities as to the relations between the central and state governments, and as to the character and bearing of state legislation; and the governor-general is bound to avail himself of the opportunity the clause in question gives him of promoting the best interests of the Australian union.

XI.

When we come to consider the subject of education—one of the matters placed under the direct control of the provincial governments—we see again the difficulties that always arise in connection with questions involving religious and sectional considerations. In the formation of the constitution it was necessary to give guarantees to the Roman Catholics or minority of Ontario, and to the Protestants or minority of Quebec, that the sectarian or separate schools, in existence at the union, should not be disturbed by any subsequent legislation of their respective provinces. It is consequently enacted in the fundamental law that while the legislature of a province may exclusively make laws on the subject of education, nothing therein shall prejudicially affect any denominational schools in existence before July, 1867. Where in any province separate schools existed in 1867 or were afterwards established by legislative authority, an appeal lies to the governor-general-in-council from any act or decision of the provincial authority affecting any right or privilege of the Protestant or Roman Catholic minority in relation to education. In case the provincial authorities refuse to act for the due protection of the rights of minorities in accordance with the constitutional law, then the parliament of Canada may pass a remedial act for the due execution of the law which

has been framed to meet such an emergency. Such a case has arisen in the province of Manitoba, where there existed under provincial statutes passed since 1870, "denominational schools, of which the control and management were in the hands of Roman Catholics, who could select the books to be used and determine the character of the religious teaching." These schools received "their proportionate share of the money contributed for school purposes out of the general taxation of the province, and the money raised for these purposes by local assessment was, so far as it fell upon Catholics, applied only towards the support of Catholic schools." But by statutes passed in 1890, the legislature of the province did away with all denominational schools, although they provide for certain religious exercises, which are to be "non-sectarian," and are not obligatory on the children when their parents object. Schools conducted according to the Roman Catholic views will receive no aid from the state, they must depend "entirely for their support upon the contributions of the Roman Catholic community, while the taxes out of which state aid is granted to the schools provided for by the statute fall alike on Catholics and Protestants." While the Catholic inhabitants remain liable to local assessment for school purposes, "the proceeds of that assessment are no longer destined to any extent for the support of Catholic schools, but afford the means of maintaining schools which they regard as no more suitable for the education of Catholic children than if they were distinctly Protestant in their character." This statement of the grievances of the Roman Catholic minority of Manitoba is given in the language of the lords of the judicial committee of the privy council of England, to whom the question of the right of that minority to appeal to the governor-general-in-council of Canada under the constitutional law, governing such matters, was expressly referred. The governor-general-in-council has passed the order contemplated by law, calling upon the legislature of Manitoba to remedy the grievance of the minority and this matter is consequently now relagated to the proper provincial authority.[1] Only in case of its refusal to provide a constitutional remedy, can the supreme power of the parliament of the Dominion be called into operation. The subject is necessarily one of great embarrassment, since it involves an interference of dominion power in what is primarily, under ordinary conditions, within the exclusive jurisdiction of a province. The fact that the judicial committee, or the highest court of the empire, has practically decided that a right or privilege of the Roman Catholic minority has been affected, and that a remedy should

[1] Since this paper was written the provincial government have sent an answer, practically refusing to obey the order, but the dominion government have not yet introduced any remedial law on the subject. They have deemed it advisable to enter into further correspondence with the Manitoba executive, in the hope of some settlement, and on the understanding that a session of parliament will be held early in January, 1896, to consider the whole question in accordance with the law of the constitution. See Can. Com. Hansard, July, 1895.

be provided in accordance with the constitution, has given a judicial aspect to this vexed question that it would not possibly assume were it a mere matter of political controversy or sectional agitation, and has thrown a very serious responsibility upon those whose duty it is to obey the law of the constitution and respect the judgment of the courts who, under a federal system, can be the only safe interpreters of the written fundamental law.

All these questions show some of the difficulties that are likely to impede the satisfactory operation of the Canadian federal system, and the projected Australian federation is fortunate in not having similar intensified differences of race and religion to contend with. Its constitution wisely leaves all educational and other purely local matters to the exclusive jurisdiction of the "states," and does not make provision for the exercise of that delicate power of remedial legislation which is given to the Canadian parliament to meet conditions of injustice to creed or nationality.

Throughout the structure of the Canadian federation we see the influence of French Canada. The whole tendency of imperial as well as colonial legislation for over a hundred years has been to strengthen this separate national entity, and give it every possible guarantee for the preservation of its own laws and religion. The first step in this direction was the Quebec Act of 1774, which relieved the Roman Catholics of Canada from the political disabilities under which they had suffered since the conquest. Seventeen years later what is known as the imperial "Constitutional Act" of 1791, created two provinces, Upper Canada (Ontario), and Lower Canada (Quebec), with the avowed object of separating the two races into distinct territorial divisions. From 1792 until 1840, when the Canadas were re-united, there was a "war of races" in French or Lower Canada, where the English party, who had all the executive and official power in their hands, became eventually embroiled with the popular and French majority in the assembly. When the insurrection led by Louis Papineau—an eloquent and impulsive French Canadian—had been easily repressed, French Canada was united to the western or English section, and an equal representation was given to both provinces in the elected assembly, although the French had still the larger population. The English language was alone to be used in the legislative records. The main object of these constitutional changes was confessedly, as foreshadowed by Lord Durham, "to establish an English population, with English laws and language, in the province, and to trust its government to none but a decidedly English legislature." The attempt to denationalize the French Canadians signally failed; the union of 1841 came too late to destroy or even minimize the work of the Quebec and Constitutional acts for over half a century. French Canada became a powerful factor in the affairs of the union that lasted from 1841 to 1867; the French language was restored, the elective councils that Papineau fought for were won,

and responsible government—the principles of which that popular chief never understood—was established largely through the discretion and ability of Lafontaine and other French Canadian public men who saw that their great advantage lay in the operation of such a system. If Sir John Macdonald was able to exercise so much influence in the politics of Canada before and after confederation, it was largely—sometimes entirely—through the aid of men like Cartier and his compatriots, who recognized in that eminent statesman that liberality as well as pliability which would enable their race to hold their own against the aggressive assaults of the extreme reformers or "Clear Grits," led by Mr. George Brown, a very able but impracticable politician, who did not give sufficient importance to the fact that Canada could be governed only by principles of compromise and conciliation in the presence of a large and closely welded French Canadian people, jealous of their institutions and their nationality. Eventually government got to a deadlock in consequence of the difficulties between the two political parties; a majority of French Canadian and a minority of English representatives, comprising the conservatives led by Macdonald and Cartier, and a majority of western or English and a small minority of French members, comprising the liberals and grits, led by Brown and Dorion. These political difficulties, arising from the antagonism of nationalities, led to the federation of all the provinces and to the giving of additional guarantees for the protection of French Canadian interests. In the senate of the Dominion, Quebec has a representation equal to that of English Ontario, with nearly double the population, with the condition that each of its twenty-four members shall be chosen from each of the districts of the province—a condition intended to ensure French Canadian representation to the fullest extent possible.

In the adjustment of representation in the house of commons, from time to time, the proportion of sixty-five members, given by the union act to Quebec, cannot be disturbed. The jurisdiction given to the provinces over civil rights and property, and the administration of justice except in criminal matters, was chiefly the work of French Canada, whose people have since 1774 accepted the criminal law of England, but have not been willing to surrender their civil code, based on the *Coutume de Paris*, which they have derived from their French ancestors. Both the French and English languages are used in the debates, records and journals of the parliament of the Dominion and the legislature of Quebec. It would be difficult to conceive a constitution more clearly framed with the view of protecting the special institutions of one race, and perpetuating its separate existence in the Dominion. Of course, the industrial energy of the English people, and the necessity of speaking the language of the English majority, have to a certain extent broken down the barriers that language imposes between nationalities, and it is only in the isolated and distant parishes of Quebec that we find persons who are ignorant of English. The political

consequences of the legislation of the past century have been to cement the French Canadian nationality, to make it, so to speak, an *imperium in imperio*, a supreme power at times in the Dominion. It must be admitted that on the whole, rational and judicious counsels have prevailed among the cultured and ablest statesmen of French Canada at critical times, when rash agitators have attempted to stimulate sectional and racial animosities and passions for purely political ends. The history of the two outbreaks of the half-breeds in the Northwest, and of the recent school legislation in Manitoba so far as it has gone, show the deep interest taken by French Canadians in all matters affecting their compatriots and co-religionists, and the necessity for caution and conciliation in working out the federal union. The federal constitution has been largely moulded in their interest, and the security and happiness of the Canadian Dominion in the future must greatly depend on their determination to adhere to the letter as well as spirit of this important instrument.

XII.

When we compare the British North America Act of Canada with the draft of the bill to constitute the federation of Australia, that was the result of the convention of 1891, we must be impressed by the fact that the former appears more influenced by the spirit of English ideas than the latter, which has copied many of the features of the constitution of the United States. In the preamble of the Canadian act we find expressly stated "the desire of the Canadian provinces to be federally united into one dominion under the crown of the united kingdom of Great Britain and Ireland, with a constitution similar in principle to that of the united kingdom," while the preamble of the proposed Australian constitution contains only a bald statement of an agreement "to unite in one federal commonwealth under the crown." The word "commonwealth" has certainly a general application to a body politic governed on popular principles, and has been constantly so used by poets, orators and writers who have not been called upon to study accuracy of expression. We all remember that Shakspere has said—

> "Hear him debate of commonwealth affairs,
> You would say, it hath been all-in-all his study."[1]

And again—

> "And now, forsooth, takes on him to reform
> Some certain edicts and some strait decrees
> That lie too heavy on the commonwealth."[2]

But the language of the poet can hardly make us forget a very trying period of English history, when the crown was beneath the heel of a

[1] "Henry V.," act i., sc. i.

[2] "Henry IV.," 1st part, act iv., sc. iii.

republican and military despotism — a period best remembered for Cromwell's genius and his successful assertion of England's greatness on sea and land in her conflict with foreign nations. Professor Freeman, in his review of federal government, gives us four famous examples of federal commonwealths—the Achaian League, the Swiss Confederation, the Seven United Provinces of the Netherlands, and the United States of America—all of which stand out at different epochs of the world's progress as remarkable illustrations of the republican system. All of us will also remember that Dr. James Bryce, in his elaborate criticism of republican institutions, could find no more expressive title for his work than "The American Commonwealth." No doubt the word has come to mean a pure republic or democracy, when used in a specific and definite sense by publicists of these days. Shakspere might use all the license of the poet in his dramas; for he was not bound by those rules of correct expression which one would expect from Australian statesmen engaged in framing a new constitution for countries not yet separated from England or governed on a purely republican system of institutions, such as elected president, governors, judges and officials generally.

When we consider the choice of this word of dubious significance, as well as the selection of the word "state" instead of "province," of "house of representatives"[1] instead of "house of commons," of "executive council" instead of "privy council," we may well wonder why the Australians—all English by origin and aspiration—should have shown so steady an inclination to deviate from the precedents established by a Dominion only partly English with the view of carving ancient historic names on the very front of its political structure.

It is an interesting fact not generally known—but the present writer had it from the lips of Sir John Macdonald himself—that the word "Dominion" was only adopted as a compromise in response to the wishes of the English ministry of the day, who were not willing to take the suggestion made by some of the Canadian delegates to the Westminster conference of 1866 that the new federation should be described in the union act as "the kingdom of Canada," simply because English statesmen were afraid to wound the susceptibilities of the people of the United States, who still retained a feeling of antagonism to England arising out of the civil war, and had so recently resented the attempt made by the French emperor to interfere in the affairs of Mexico, and establish in America

[1] The present popular house of New Zealand is called a "house of representatives," and this is not strange when we recall the republican principles of Sir George Grey, who is an earnest advocate of elective governors-general and other republican practices. But this eccentric colonial statesman does not appear to be responsible for the phraseology of the proposed constitution. The debates of the convention, of which he was a member, show that the majority desired to make their new constitution a copy, as far as practicable, of that of the United States.

what would be really a dependency of the French empire. It would, perhaps, be quite in accord with the ambitious aspirations of Australians were they to substitute the words "United Australia" for a word of dubious significance like "commonwealth."

In leaving to the "states" the right of appointing or electing their "governors"—not lieutenant governors as in Canada—we see also the desire to follow the methods of the states of the American republic; and we may be sure that, when once the commonwealth is in operation, it will not be long before the heads of the executive authority will be chosen by popular vote, and we shall see the commencement of an extension of the democratic elective principle to all state administrative, executive and even judicial officers, now appointed by the crown under the advice of a ministry responsible to parliament for every appointment, and other acts of administrative and executive authority.

We see also the imitation of the constitution of the American republic in making the central government alone one of enumerated powers, and leaving the residuary power in the "states." The word "parliament" is also generally applied to the legislative bodies of the federal and state governments, another illustration of the dominant influence of the respective colonies—hereafter "states"—in the proposed constitution.

We see the same American influence in the provision that, "when a law [*sic*] passed by the parliament" [*sic*] is presented to the governor-general "for the queen's assent," he may "return it to the parliament [*sic*] with amendments which he may desire to have made in such law" [*sic*]. One cannot understand the reasoning which justifies the giving of such a power to the executive head: it is quite irreconcilable with the principles and practice of responsible government. The governor-general must, in all cases affecting the government of the colony, act under the advice of ministers. In this case, however, he is to assume the dubious position held by similar officers before there was a ministry responsible to him and the two houses for all legislation. One may also humbly inquire how a bill becomes a "law" before it has received the assent of the queen, through the governor-general. When did "parliament" mean only the two houses in any legal or constitutional document? Such loose phraseology might do for common parlance, but not for a proposed statute, especially when in a former clause "parliament" is said to "consist of her majesty, a senate and a house of representatives." We think that here at least the draughtsmen of the bill might advantageously have copied the correct language of the American republican constitution, which never uses "law" in so incorrect a sense, if they were not prepared to accept the British North American Act as their model, though it was prepared under so high an authority as Lord Thring.

Again, while the bill provides for a supreme and other federal courts to be appointed and removed by the authorities of the commonwealth—

and the influence of the American example is seen in the very language setting forth the powers of these judicial bodies—the "state" governments are to have full jurisdiction over the "state" courts. The federal judges can be removed, as in Canada, only by successful impeachment in parliament and on address of the two houses to the governor-general in council, and as long as the present constitutions of the Australian colonies remain unchanged the "state" judges can be removed only by the action of the "state" parliament. The Canadian constitution in this respect appears to give greater security for an independent and stable judiciary, since a government operating on a large sphere of action is likely to make better appointments than a small and less influential body within the range of provincial jealousies, rivalries and faction. Indeed, it is not going too far to suppose that, with the progress of democratic ideas—already rife in Australia—we may have repeated the experience of the United States and elective judges make their appearance in "states" at some time when a wave of democracy has swept away all dictates of prudence and given unbridled licence to professional political managers only anxious for the success of party.

As respects any amendment of the constitution after its adoption, the Australians have also copied the constitutional provision of the American republic—that whenever two-thirds of the houses of congress or of the several states shall deem amendment necessary, it will be submitted to a convention and form part of the constitution when ratified by the legislatures or conventions of three-fourths of the states, as congress may determine. The Australian bill permits an amendment to be proposed by the two houses of the parliament of the commonwealth, and then submitted to conventions of the several states; but it must be ratified by conventions of a majority of the states, who represent a majority of the people of the federation, before it can be submitted to the governor-general for the queen's assent. The Canadian constitution may be amended in any particular, where power is not expressly given for that purpose to the parliament or legislatures, by an address of the Canadian senate and commons to the queen—in other words, by the English parliament that enacted the original act of union—and without any reference whatever to the people voting at an election or assembled in a convention. Of course, it may be said that the reference to the imperial authorities will not be much of a restraint on amendment, inasmuch as it is not likely that a parliament, already overburdened by business, will show any desire to interfere with the expression of the wishes of the Canadian houses on a matter immediately affecting the Canadians themselves. So far there have been only three amendments made by the imperial parliament to the British North America Act in twenty-seven years, and these were simply necessary to clear up doubts as to the powers of the Canadian houses. This fact says much for the satisfactory operation of the Canadian constitution, as well

as for the discretion of Canadian statesmen. The Canadian constitution, in this particular, clearly recognizes the right of the supreme parliament of the empire to act as the arbiter on occasions when independent, impartial action is necessary, and to discharge that duty in a legislative capacity, which the judicial committee of the privy council now performs as the supreme court of all the dependencies of the crown. The Australians propose to make themselves entirely independent of the action of a great parliament, which might be useful in some crisis affecting deeply the integrity and unity of Australia, and to give full scope only to the will of democracy expressed in popular conventions. It is quite possible that the system will work smoothly, and even advantageously, though we should have preferred, on the whole, to see less readiness on the part of English colonies to reproduce purely republican ideas and methods of government and to lessen the weight and influence of the parliament and supreme court of the whole empire in the government of the proposed Australian federation.

XIII.

It is not the intention of the writer to review the financial features of the proposed federation of Australia, as that would be presumptuous on the part of a Canadian who cannot have that local knowledge which would enable him to write intelligently or confidently on the subject. All that he has ventured to do is to give his opinion on certain constitutional and political differences between the Canadian system and that suggested for Australia. But before passing away from the Australian bill, there is one matter to which allusion may be appropriately made. The Australian scheme proposes to reproduce that feature of the Canadian constitution which prohibits "dual representation," that is to say, the return of the same man to both the dominion parliament and a provincial legislature. It is questionable, however, if this law has operated as satisfactorily as was anticipated when it was passed at the inception of confederation. The great number of representatives required for the several legislative bodies of Canada, over 700[1] in all, has made a steady drain on the intellectual and business elements of a Dominion of only five millions of people. Many thinking men now believe, after the experience of the last quarter of a century, that the presence of able and experienced men both in the central and local legislatures might do much to prevent many sectional jealousies and rivalries and tend to a larger appreciation of the diverse wants and necessities of the provinces, and to a wider national sentiment, than seems possible under a system of practically restrictive representation or legislative isolation.

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[1] See Bourinot's 'How Canada is Governed' (Toronto, 1895), p. 159.

XIV.

Every Englishman will consider it an interesting and encouraging fact that the Canadian people, despite their neighbourhood to a great and prosperous federal commonwealth, should not even in the most critical and gloomy periods of their history have shown any disposition to mould their institutions directly on those of the United States and lay the foundation for future political union. Previous to 1840, which was the commencement of a new era in the political history of the provinces, there was a time when discontent prevailed throughout the Canadas, but never did any large body of the people threaten to sever the connection with the parent state. The act of confederation was framed under the direct influence of Sir John Macdonald and Sir George Cartier, and although one was an English Canadian and the other a French Canadian, neither yielded to the other in the desire to build up a Dominion on the basis of English institutions, in the closest possible connection with the mother country. While the question of union was under consideration it was English statesmen and writers alone who predicted that this new federation, with its great extent of territory, its abundant resources, and ambitious people, would eventually form a new nation independent of England. Canadian statesmen never spoke or wrote of separation, but regarded the constitutional change in their political condition as giving them greater weight and strength in the empire. The influence of England on the Canadian Dominion can be seen throughout its governmental machinery, in the system of parliamentary government, in the constitution of the privy council and the houses of parliament, in an independent judiciary, in appointed officials of every class—in the provincial as well as dominion system—in a permanent and non-political civil service, and in all elements of sound administration. During the twenty-eight years that have passed since 1867, the attachment to England and her institutions has gained in strength, and it is clear that those predictions of Englishmen to which we have referred are completely falsified so far, and the time is not at hand for the separation of Canada from the empire. On the contrary, the dominant sentiment is for strengthening the ties that have in some respects become weak in consequence of the enlargement of the political rights of the Dominion, which has assumed the position of a semi-independent power, since England now only retains her imperial sovereignty by declaring peace or war with foreign nations, by appointing a governor-general, by controlling colonial legislation through the queen-in-council and the queen in parliament—but not so as to diminish the rights of local self-government conceded to the Dominion—and by requiring the making of all treaties with foreign nations through her own government, while recognizing the right of the dependency to be consulted and directly represented on all occasions when its interests are

immediately affected. In no respect have the Canadians followed the example of the United States, and made their executive entirely separate from the legislative authority. On the contrary, there is no institution which works more admirably in the federation—in the general as well as provincial governments—than the principle of making the ministry responsible to the popular branch of the legislature, and in that way keeping the executive and legislative departments in harmony with one another and preventing that conflict of authorities which is a distinguishing feature of the very opposite system that prevails in the federal republic. If we review the amendments made of late years in the political constitutions of the states, and especially those ratified quite recently in New York, we see in how many respects the Canadian system of government is superior to that of the republic. For instance, Canada has enjoyed for years, as results of responsible government, the secret ballot, stringent laws against bribery and corruption at all classes of elections, the registration of voters, strict naturalization laws, infrequent political elections, separation of municipal from provincial or national contests, appointive and permanent officials in every branch of the public service, a carefully devised code of private bill legislation, the printing of all public as well as private bills before their consideration by the legislative bodies; and yet all these essentials of safe administration and legislation are now only being introduced by constitutional enactment in so powerful and progressive a state as New York. Of course, in the methods of party government we can see in Canada at times an attempt to follow the example of the United States, and introduce the party machine with its professional politicians and all those influences that have degraded politics since the days of Jackson and Van Buren. Happily, so far, the people of Canada have shown themselves fully capable of removing those blots that show themselves from time to time on the body politic. Justice has soon seized those men who have betrayed their trust in the administration of public affairs. Although Canadians may, according to their political proclivities, find fault with the methods of governments and be carried away at times by political passion beyond the bounds of reason, it is encouraging to find that all are ready to admit the high character of the judiciary for learning, integrity and incorruptibility. The records of Canada do not present a single instance of the successful impeachment or removal of a judge for improper conduct on the bench since the days of responsible government, and the three or four petitions laid before parliament, in the course of a quarter of a century, asking for an investigation into vague charges against some judges, have never required a judgment of the house. Canadians have built wisely when, in the formation of their constitution, they followed the English plan of having an intimate and invaluable connection between the executive and legislative departments, and of keeping the judiciary practically independent of the other authorities of government. Not only the life and pros-

perity of the people, but the satisfactory working of the whole system of federal government rests more or less on the discretion and integrity of the judges. Canadians are satisfied that the peace and security of the whole Dominion do no more depend on the ability and patriotism of statesmen in the legislative halls than on that principle of the constitution which places the judiciary in an exalted position among all the other authorities of government, and makes law as far as possible the arbiter of their constitutional conflicts. All political systems are very imperfect at the best, legislatures are constantly subject to currents of popular prejudice and passion, statesmanship is too often weak and fluctuating, incapable of appreciating the true tendency of events, and too ready to yield to the force of present circumstance or dictates of expediency ; but law, as worked out on English principles in all the dependencies of the empire and countries of English origin, as understood by Marshall, Story, Kent, and other great masters of constitutional and legal learning, gives the best possible guarantee for the security of institutions in a country of popular government.

II.—*An Iroquois Condoling Council.*

By HORATIO HALE, M.A. (Harvard).

(Read May 15, 1895.)

The remarkable confederacy of Indian tribes which, under the name of the "Five Nations" (and later the "Six Nations"), formerly bore sway, from their central abode in northern New York, over a large portion of what is now the United States and Canada, and who may be said to have held for a century the balance of power on this continent between England and France, possessed a form of government which, even while imperfectly understood, excited the curiosity and admiration of many intelligent inquirers. The early Jesuit missionaries, and, after them, Cadwallader Colden, Sir William Johnson, De Witt Clinton and other observers and writers of equal note, had told much about them, all bestowing high praise on the consummate political ability manifested in their league, but all, as it finally appeared, with only a very imperfect understanding of the true basis and real nature, origin and objects of this league. It remained for our own time and for the genius of a scientific investigator of the first order of intellectual power, the late Hon. L. H. Morgan of Rochester, N. Y., to disclose the secrets of this wonderful system—a system so intricately wrought, so profoundly based, so far-reaching, and so beneficently purposed, that its details recorded in his famous book, "The League of the Ho-de-no-sau-nee or Iroquois" (published in 1851), while awakening the admiration of all its readers, have in certain respects staggered the belief of some of the most eminent among them. Some justly esteemed historical writers, with large claims to philosophical insight, have been unable to accept the assurance that the primary object of the "high chiefs" representing the Iroquois tribes in their first council of alliance—"barbarians of the stone age" though they were—was to establish a form of government which should not only prevent strife among their own tribes, but might be so extended as to put an end to war among all nations, and to bring about universal peace. A greater philosopher, whose mental vision has been large enough to embrace all races, civilized and savage, and their known political systems, ancient and modern, has found no such difficulty. Mr. Herbert Spencer, in his recent volume, "The Principles of Ethics," quotes Morgan's statement on this point, accepts it without reserve, confirms it by other examples, and points out the facts of human nature on which they are all based. Every government reflects the character of the people who frame it or who willingly submit to it. A people, whether barbarous or civilized, who among themselves are peaceful and united, will have a government tending to peace and unity, both

at home and with other communities. And, on the other hand, a tribe or nation of selfish and quarrelsome people, whatever may be their state of culture, will have a selfish and quarrelsome government.

It was my fortune to carry forward the investigations of my friend, Mr. Morgan, under circumstances somewhat more favourable than those which had enabled him to achieve such admirable results. The league which he so well describes was not studied by him in its complete frame and living action, but only in its fragments, and from the reports of former members, long after its disruption and the exile of the great body of its component tribes. As is well known, the majority of the Six Nations, under the influence of Sir William Johnson and his family, adhered to the British side in the American War of Independence, and at its close removed to Canada. There, on land that had once been under the rule of the confederacy, comprising the fertile plains which border the Grand River, and which now form part of the county of Brant (so named from their leading war-chief), they restored, or rather continued, their political system, in all its primitive forms and vigour, which it still retains. Of this system I have given a brief account in a paper read before the American Association for the Advancement of Science at its annual meeting in 1881, and published in the proceedings of that year, and a much fuller description in a volume entitled "The Iroquois Book of Rites," published in 1883 in Dr. Brinton's well-known Library of American Aboriginal Literature. The particulars comprised in these descriptions were mainly gathered during many visits to the "Six Nations' Reserve," near Brantford, Ont., and in great part through the invaluable mediation and assistance of my late friend, Chief George H. M. Johnson, whose hospitable home (from which he took his Indian name of Onwanonsyshon, "Lord of the Great House")—an elegant and stately mansion known as "Chiefswood," embowered in a fine park and overlooking the "wide and winding" Grand River—was my agreeable abode during these visits.

I may be pardoned for a few personal references to this much esteemed friend and his family. Mr. Johnson was both an Iroquois chief and an Anglo-Canadian gentleman, and in both capacities was highly respected. He was the son of a leading chief, who had held for many years the office of Speaker of the Six Nations' Council, and had been noted for his silver-tongued eloquence. This chief was himself of half-blood origin, as was also his wife. Chief George traced his pedigree on the one side to a high Anglo-American source, and on the other to one of the great chiefs, fifty in number, who were the chosen colleagues of the founder of the league. This founder was the famous Hiawatha—no mythological personage, but an Onondaga chief,—who lived about four centuries ago, and whose name, and the names of his companions in the first council, descended, like those of the first two Cæsars, or like the terri-

torial names of English peers, to be titles of honour for their successors. Chief George's title, which he had received from this ancient progenitor on his mother's side, was Teyonhehkon, meaning "Double Life." I have known many other bearers of these antique titles (several of whom will be named in this narrative), and among them a modern Hiawatha, a handsome young chief, whose pleasing face and graceful bearing might fairly enough have represented the poetical hero whom Longfellow, using the licence of his art, has transported to the shores of Lake Superior and made the Ojibway lover of Minnehaha. Mr. Johnson held also a humbler but more lucrative title, that of Government Interpreter for the Reserve, which made him the *ex-officio* aide and executive officer of the Visiting Superintendent of the Reserve, Col. Gilkison. He had been well educated by the English missionaries, and had married a missionary's sister, an accomplished English lady, a kinswoman of one of the most admired of American authors, Mr. W. D. Howells. That the children of this union should be above the average, in mind as well as in person, might be expected. Those who have seen and heard one of them, Miss E. Pauline Johnson, the charming poet and reciter, will know the source of the grace and talent which have delighted many audiences.

Though I had attended many public ceremonies and festivals of the Indians, in company with these and other friends, I had not, when my book was composed, had the opportunity of witnessing the rarest and by far the most important of them all. I had, however, given a chapter to it, derived partly from the reports of others who had often attended it, and partly from two remarkable native manuscripts which are described in the volume. This ceremony is the "Condoling Council," at which a deceased chief is publicly lamented, and his successor is endowed with his office and title, and is formally received into the Great Council of the league. It is styled by Morgan the "Mourning Council," but my Iroquois friends preferred the rendering which I have given to the native name, as more clearly expressing the sympathetic nature of the ceremony. Morgan's description is excellent, and any one who refers to it will see in the narrative now to be given from my journal how closely, after the lapse of more than thirty years from the time he wrote, and amid widely different surroundings, the ancient rites have been adhered to. If I am not mistaken, the mingling of civilized customs and manners with these antique ceremonials adds to them a piquancy which makes up for the loss of some of the solemnity that anciently attended them. The following description is a literal copy of my journal written at the time, with merely the omission of a few personal matters and the addition of some needed explanations. I have retained, moreover, certain particulars which will give evidence of the remarkable advance in civilization that had been made by these Indians in less than a century. They may help to dissipate the prejudices, if any still exist, which at one time pronounced the

American aboriginal tribes incapable of competing with the whites in the arts of cultured life.

July 16th, 1883.—This morning I received a letter from my good friend, Mrs. Johnson of Chiefswood, informing me that the Condoling Council, after many postponements, was finally fixed to take place to-morrow. I started by the early afternoon train for Onondaga station, where I had a pleasant greeting from my young friends, Misses Eva and Pauline. I drove with them to Chiefswood, and met the usual cordial reception. The chief was in the field, assisting his tenant with the hay, but promptly made his appearance. He had just received word from Col. Gilkison that his services as interpreter and secretary would to-morrow be required elsewhere on the Reserve about some important public business, and he will therefore be unable to accompany me to the Onondaga "Long-House," where the council is to be held; but as this will not commence until noon, he hopes to join me there early enough in the afternoon to give me all necessary help in the way of explanations.

July 17th.—Soon after eleven I started with old Peter—a good-natured old Mohawk who helps about Chiefswood as hostler and factotum. We drove eastward along the south bank of the Grand River, which is now full from the recent rains, and is a noble stream. The country wore its most attractive aspect—the trees in full foliage, the crops and meadows luxuriant. After passing the Middleport Ferry we turned southward toward the centre of the Reserve. I remarked the usual signs of improvement which I observe at every visit—new buildings, the fences and fields in better condition, in one place a large brick school-house lately completed, in another a row of young trees planted for a quarter of a mile along the roadside fence. On the farms substantial frame and log-houses alternate, and there are some good barns—on one farm two of these buildings, with a general air of thrift and good cultivation. Turning out of the main road, down a winding track, through low trees and bushes, we came to a small clearing, in which several waggons stood, with horses tethered. At a little distance the Onondaga Long House appeared on an eminence beyond.

Fastening our horse in the shade of a tree, with a good supply of newly-cut hay, we took the path over a style and up the acclivity to the Council House. On approaching it we found a little group of men seated on the sward, among whom I distinguished the pleasant features of my friend, Chief John Buck (Skanawati), and the grave aspect of my old Clinton acquaintance, John Fraser, now a high chief of the Mohawk nation, with a sesquipedalian title which I remembered. Taking a place beside them, I greeted them by their Indian titles, which called forth good-humoured smiles from the circle. Just then a rather tall, slender young man, well dressed, and with a highly intelligent countenance, whose features, complexion and manner might have enabled him to pass for a

gentleman from the south of Europe, came up and was introduced to me as Chief Alexander G. Smith, the church interpreter. He said that on his way he had met Col. Gilkison and Chief Johnson, and had been specially enjoined by them to render me all the assistance in his power, which he would be glad to do. I learned that he had been left an orphan in early childhood, and had by his own exertions made his way up in a very creditable manner. He had prevailed on the authorities to send him to the Mohawk Institute, where he made such good proficiency that he had been transferred to the Brantford High School. Afterwards he had taught a school for a year or two, and then, on the death of the late church interpreter, Carpenter, he had been appointed to succeed him. Bishop Helmuth had been his friend, and had offered to furnish him with $100 a year towards the expense of a university education; but in the meantime he had married, and had a young family growing up, whose support required his exertions at home. He still found time to continue his studies, and was now forming a library of books relating to the Indians, in which he solicited my advice and assistance.

Presently we retreated from the sun into the Council House, where I found, among others, my distinguished acquaintances the Onondaga chief, John Gibson (Atotarho), and his son of the same English name, the intelligent blind chief and maker of lacrosse-bats, who bears, in the right of his Seneca mother, the title of Kanyadariyo. Both greeted me in friendly fashion. Chief John Buck said they were now all going to a neighbouring house for dinner, and invited me to join them; but as I had brought some lunch—through the provident kindness of Mrs. Johnson,—I remained in the Council House, which was left for a time to my sole occupation. Before long, however, knots of newly arrived chiefs began to collect on the sward before the building. On joining them I found several acquaintances among them, who told me that the chiefs of the younger nations (Oneidas, Cayugas, Tuscaroras and others) were assembling at the Cayuga Long-House, a mile or two distant. Before long a grave, middle-aged person came to us, with a business-like air, from that direction. He was, I learned, a messenger, sent to inform us that the condoling party were ready to make their appearance, and desired to know if we were prepared to receive them. As the chiefs who were to be lamented on this occasion belonged to the elder nations (that is, were either Mohawks, Onondagas or Senecas), the duty of condolence fell on the junior members of the confederacy. The messenger was told to inform his friends that all would be ready in a short time for what is known as the preliminary ceremony, bearing in Indian the ponderous name of *Deyuhnyonkwarakda*, which, being interpreted, is the "reception at the wood's edge," the last four English words being the literal rendering of the polysyllabic Iroquois term.

John Buck and his companions, including my new friend the church

interpreter, had now rejoined us, and we all left the Council House in a body, and, crossing a little valley on the north side, came, in something less than a quarter of a mile, to an open space or nook in a belt of woodland which was deemed appropriate for the ceremony. There two young men were already busy in kindling a small fire of chips and branches. Near this ancient symbol of welcome—at which, it was understood, the calumet of friendship was to be lighted—we disposed ourselves on the grass or on fallen tree-trunks, and awaited the coming of our guests. I took the opportunity of making a list of the chiefs of the elder nations who were present at the ceremony. They were:

High Chiefs.

Onondagas.

English names.	Native names.	Meaning.
John Buck	Skanawati	Beyond the river.
John Gibson	Atotarho	Entangled.
William Buck	Tehatkahtons	Looking both ways.
Johnson Williams	Tehayatkwarayen	Red wings.
William Echo	Hahriron	Scattered.
Elijah Johnson	Ronyenyennih	(Meaning unknown.)
Peter Key	Enneseraron	(Meaning unknown.)

Mohawks.

John Fraser	Ahstawenserontha	Putting on rattles.
Peter Powless	Satekariwate	Two things equal.

Senecas.

David Hill	Kanokarih	Threatened.
John Gibson, Jr.	Kanyadariyo	Beautiful lake.

Assistant Chiefs.

Alex. G. Smith	Dakanenraneh	Double row of people.
David John	Wahojikwayoha	He could not find a war-club.
Nicholas John	Kanekenthwat	(Name of venomous insect.)

It thus appears that the conservative Onondagas chiefly conduct these ceremonies—which are supposed to have a flavour of paganism about them,—and that few but the high chiefs, *rotiyaner*, take an active part in them.

Mr. Smith says that, as a general rule, each high chief has his assistant chief (or war-chief), though to this there are some exceptions. The assistant chief is usually, but not always, a member of the same family as that of his high chief, and, on the death of the latter, is frequently promoted to his position. If not so promoted, he still remains the assist-

ant chief of the new holder of the title. The assistant chiefs are not only the executive officers of their high chiefs, but in the council they are expected to do most of the speaking. The duty of the high chiefs is to consult together and decide. It is below their dignity to expend their forces in mere speech-making. The assistants have no special titles as chiefs, but continue to be called by their original names. They are, however, usually installed at Condoling Councils, like the high chiefs. Sometimes, however, of late years, they are simply appointed by the Central Council at Ohsweken. It was in this way that he himself had been lately made a chief, the honour having been conferred without any intimation to him that it was coming. He is the assistant of my friend, John Fraser.

While we were conversing, the sound of a measured chant was heard in the distance. All eyes were turned on the neighbouring woods, from which was presently seen to issue the portly form of the Cayuga chief Wage (*Hadwennine*, "His words are moving"), the high constable of the Reserve, who is commonly known as Sheriff Wage. With the dignity of a Roman pontifex, he led the chant and the procession. Behind him followed the line of chiefs of the younger nations—Cayugas, Oneidas, Tuscaroras, Delawares, Nanticokes, and Tutelos, for so far has the confederacy been enlarged by later adoptions. At least all these should have been—and possibly were—represented in the score of farmer-like men, of grave and swarthy visages, who followed the melodious high constable. Beyond them came the brightest part of the spectacle—a little troop of women and girls, dressed in the gayest style of the very pretty fashion which the Indian women of Canada, much to the credit of their good taste, have adopted. Trim bodices, short, spreading skirts of brilliant colours—usually some shade of red,—gay, variegated scarfs and shawls, with broad-rimmed straw hats or bright-hued kerchiefs, and prettily embroidered leggings, make a very attractive garb, especially when seen in a procession or group. When the party came near us the singing ceased. The sheriff arranged his chiefs in a line opposite to us, about ten yards from our own party, who all remained seated as before. A little way from the sheriff's line the women and children grouped themselves about a huge tree-stump, which they hid in a cluster of glowing colours.

It was now the duty of our chiefs to welcome their sympathizing guests. To my surprise, the person deputed to perform this duty was my blind friend, the younger John Gibson (Kanyadariyo). A fine musical voice, a good memory, and a pleasing presence, to which his lack of vision added a touch of the pathetic, qualified him well for the office. A friend led him by the arm, and with him walked gravely to and fro in the space between the hosts and the guests, while the blind singer, with figure upright and visage bent toward the ground before him, intoned in high, quavering notes the chant of welcome, in the precise words in which it is given in the Book of Rites. There were, of course, many pauses

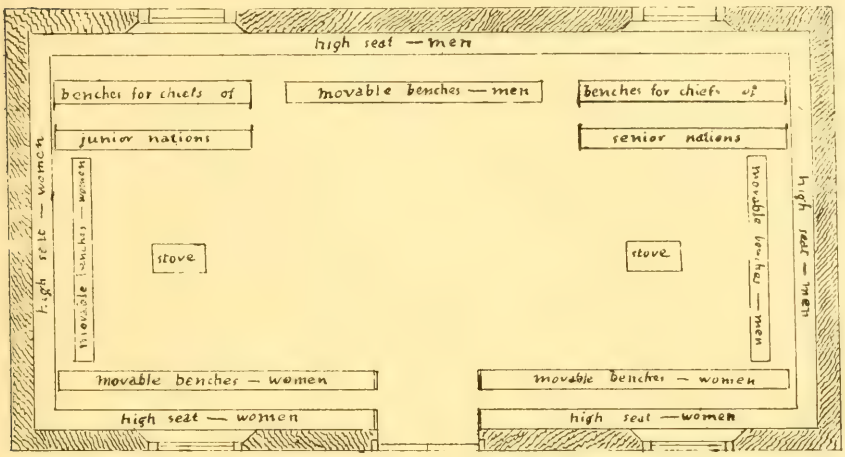
between the periods, which were filled up with long-drawn utterances of the musical interjection, *Haih-haih*, without which an Iroquois chant seems impossible. With this exception, if such it can be called, the chief's remarkable memory enabled him to follow the traditionary words quite accurately, and even to recite in proper order the long list of names of ancient towns, where there was nothing in the sense to guide his recollection. I thus learned—what I had not before understood—that this portion of the Book of Rites was intended to be, not spoken, but sung. Subsequently it appeared that the remainder of the book, including even the "Laws of the League," was in the same category.

When the blind singer had finished and was led back to his place, Chief Wage advanced, and, holding some strings of wampum in his hand, made in his ordinary tones a brief address of condolence, to which a chief on our side responded in the same manner. At this point the pipe should have been lighted at the fire of welcome and passed around. Why this part of the ancient ceremony was omitted I did not at the moment think of inquiring. It was perhaps to save time, as the day was well advanced. Suddenly, at the close of their spokesman's address, our chiefs arose, and led the way in loose procession to the Council House, followed by their people, and at a little distance by their guests in a separate file. Many more women and children had then come up, and now joined in the line. As the long varicoloured train wound through the trees and across the valley, it made a pretty view, and we got a glimpse at last of what the assembling of a Condoling Council of the ancient times may have been.[1]

On our arrival at the Council House the chiefs in our party set themselves in some haste to arrange the benches in what was deemed a suitable style. The house is the same large edifice of hewed logs which I first visited in September, 1871, and then described in my journal. Its one apartment, forming a spacious oblong hall, about fifty feet in length by twenty-five in width, is now improved in appearance by a ceiling of

[1] To show the persistence of Indian usages, it may be interesting to note that this reception of guests with a bonfire of welcome conforms exactly to that which the explorer Jacques Cartier experienced in his first approach to the "City of Hochelaga," in October, 1535. In the narrative of his voyage, as rendered by Hakluyt, we read :—"The City of Hochelaga is six miles from the riverside, and the road thither is as well-beaten and frequented as can be, leading through as fine a country as can be seen, full of fine oaks as any in France, the whole ground being strewn over with fine acorns. When we had gone four or five miles we were met by one of the great lords of the city, accompanied by a great many natives, who made us understand by signs that we must stop at a place where they had made a large fire, which we did accordingly. When we had rested there some time, the chief made a long discourse in token of welcome and friendship, showing a joyful countenance and every mark of goodwill." The Hurons of Hochelaga were, as the words of their language preserved by Cartier sufficiently prove, nearly akin to the Iroquois of New York,—though at the time of Cartier's visit the two kindred communities were involved in a deadly warfare, brought on, according to their traditions, by the fault of the Hochelagans, and ending in their defeat and dispersion.

matched pine boards, planed, but fortunately unpainted. A high fixed seat, raised one step, extends along the sides and ends. In front of this are many movable benches, so that a double—and if necessary a triple—row of spectators can be ranged around the walls. On the present occasion two of the corners, the northwest and the northeast, were reserved for the chiefs—the former for those of the elder and the latter for those of the junior nations. To accommodate each party and enable its members readily to consult together, the movable benches at each corner were turned face to face, with an open space between them, thus:



The benches were hardly arranged when the people pressed in and filled them. At another season, I am told, particularly in the winter, the number in attendance would have been much larger; but just now the farmers are unwilling to lose a fine day from their hay harvest. As it was, however, the number—something over 200—was quite sufficient to fill the benches, and make the air of the hall uncomfortably close and warm, in spite of the open windows. The men and youths took one side of the room, the women and girls the other. The bright colours of the feminine ranks, row above row, made an agreeable contrast to the sombre lines of the opposite seats. Many of the women held babies, who were mostly as silent and, but for their black eyes, as motionless as dolls. As the long hours wore on, an occasional wail from some small parched lips was heard, but was quickly hushed by a prompt supply of their natural nutriment. Otherwise a grave and even solemn stillness seemed to hold the whole assemblage.

The silence was interrupted by an elderly Cayuga chief, Jacob Silversmith (*Teyothorehkonh*, "Doubly Cold"), who arose to begin the condoling chant—the great duty of the day. He was a tall man, of

heavily moulded figure and features, clad in the plain costume of a substantial farmer, and bearing in his hand a staff, with which he seemed to time his steady walk. Placing himself near the side of the wall occupied by the chiefs and their followers, he paced slowly to and fro from one end of the room to the other, chanting in a high, strong, not unmusical voice, with his face inclined a little forward, and his eyes steadily fixed on the floor. His look was that of a man engaged in a serious and important duty, which forbade him to spare himself or his hearers one moment of time or one quaver of his voice. He began with the Condoling Song repeating each line twice, as I have heard it sung by John Buck, with many ejaculations of "*haih-haih*" between the lines. Then, to my surprise, he took up the concluding litany of the Book of Rites, the hymn to the fifty chiefs and councillors, the founders of the League. It subsequently appeared that he left the intermediate portion of the ritual to be chanted by another singer. The litany was sung, not in its abridged form as printed, but with all the lines which, in the written and printed copies, have been omitted near the close, for brevity's sake, and which were now duly pealed forth in honour of the leaders of each ancestral clan. These lines (substituting "all hail" for "*haih-haih*") have been thus rendered:

"This was the roll of you!
All hail! all hail! all hail!
You that combined in the work!
All hail! all hail! all hail!
You that completed the work!
All hail! all hail! all hail!
The Great League!
All hail! all hail! all hail!"

These interminable repetitions, with their endless exacerbation of "*haih-haihs*," was a fearful infliction; but the sedate assembly bore it with unmoved patience. Every now and then a brief chorus of assent would be heard from the chiefs at either corner—a slow murmur, rising unexpectedly and dying away. It should be remembered that the word here rendered "League" (*Kayanerenh*) meant originally and properly "peace." It was the "great peace" among the nations, which was established by Hiawatha and his companions, that their successors in the Council had been taught to celebrate, and to impress upon the people by these elaborate ceremonies. When this fact is considered, the proceedings acquire a dignity and importance which will account for the impression produced on the assembled hearers, and which make them really worthy of our admiration. Toward the close the singer gave some signs of exhaustion. But when he sat down there was no appearance of relief in the audience. In fact, they knew that there was much more to come.

He closed abruptly, and quietly took his seat with the other chiefs of the junior nations. A pause of profound silence ensued. After a time

two young men came forward with a rope, which they drew across the room near the ceiling, where they made it fast. Over this rope was hung a patchwork quilt, in such a manner as to shut off from the chiefs of the senior nations the sight of their sympathizing guests of the junior nations. This curtain, which was doubtless in former days a screen of skins or of bark matting, was, I was told, a sign of mourning. The blind chief, Kanyadariyo, was then led from the seat which he held with the senior party, and conducted to a place behind the curtain, among the chiefs of the younger nations. He was supposed, I think, to become one of them for the nonce,—perhaps because no member of their party was as well qualified to repeat the chant of the "Laws of the League" which was to follow. From the corner behind the curtain was now heard the Condoling Song, sung this time very sweetly. the musical voice of the blind Kanyadariyo leading the chant. When it was finished he was led forward by another chief, who conducted him up and down the hall, while he sang in high, clear tones the invocation to their forefathers, and chanted the ancient laws which these had made, "to strengthen the house." Now and then he would pause, while the chiefs behind the curtain sang in chorus the last line of the Condoling Song. "*Ronkehsotah, kajathondek!*" ("O Grandsires, hear us!") "*Haih-haih! haih-haih! Kajathondek! kajathondek!*" ("Hail! hail! Hear us! hear us!") they repeated, till their voices died away in a sharp condoling wail, and the singer recommenced his chant.

I thus learned, as already stated, that the whole Book of Rites is sung, or rather intoned, after their fashion. It is, in fact, an ancient historical chant; and this accounts for the great accuracy with which it has been transmitted from one generation to another. They have continued to sing the words even after the meaning of some of them has become uncertain. If the contents of the book had been printed as they are repeated in the Council, the sentences should have been divided into brief lines, like blank verse. The genuine poetical character of the composition is now disguised by its prosaic form and rendering, precisely as is the case with the psalms and the prophetic books of the Old Testament in the ordinary version.

When Kanyadariyo had ceased, he returned to his seat in his proper corner among the elder nations. The curtain was now removed, and the two parties, the hosts and the condoling guests, were again brought into the view of one another. Then a Cayuga chief, Montour (whose native name I did not learn)—in whose fine, intelligent face the traits of his French descent were apparent,—arose to express the condolence of the younger nations. My friend, the church interpreter, was not familiar with the Cayuga dialect, and was, as he told me, perplexed by the fact that in the present recitation (as I could myself perceive) there was a continual repetition of certain particles or interjections, which would not

have been used in ordinary speech. However, he could understand enough to be able to say that the speaker was reciting the various topics of consolation, much as they are contained in the Onondaga portion of the printed Book of Rites, though generally at greater length. He "came before the mourners where they were bowed in great darkness," and "stood beside the ashes of their hearth, and sought to comfort them." He "mourned for the chief who had passed away, and who had been sent to work for the good of them all—of the warriors, the women and the children. Sooner or later they would all follow him to the grave. Meanwhile they would show their reverence for his memory. They would deck his grave, and cover it carefully, so that the rain should not penetrate into it. And he now wiped away the tears of the mourners, and bade the bright sun again shine upon them. They must remember that they had their duties to the people to perform, in the place of the chiefs who were gone." And finally he called upon them to show him the men who were proposed as candidates in place of the deceased chiefs.

While Montour spoke, he held in his hand a string of wampum, or sometimes two or three strings united together. When he had finished one topic or section of his speech, he handed the string, or knot of strings, to an attendant, who with a measured pace bore it along the hall to the upper corner, where he delivered it to Chief Skanawati (John Buck), the spokesman of the elder nations. The wampum beads were variously disposed in these strings, according to the topic which they intended to recall. For instance, the most mournful subject—the reference to the death of the late chief—was indicated by a string entirely black. The complete consolation of the shining sun was figured by a string or knot of pure white beads. In some of the other strings the white beads predominated, and in others the black. They varied also in their length, and in the number (from one to three strings) appropriated to each topic.

The style of recitation was somewhat remarkable. It was neither singing nor ordinary speaking, but a mode of utterance evidently peculiar to this part of the ceremony. He spoke in brief sentences, each commencing with a high, sudden, explosive outburst, and gradually sinking to the close, where it ended abruptly, in a quick, rising inflection. The whole was plainly a set form of phrases, which the speaker was reciting with a sort of perfunctory fervour. Occasionally there was a brief response—a low wail of assent—from the upper corner, where the chiefs of the elder nations sat motionless, with their faces bowed, during the whole recital. The ceremony had taken nearly an hour, and some eleven or twelve of the wampum tokens had passed before it was completed.

Three hours had now been occupied by this monotonous chanting and recitation, and I hoped that the end had been reached. The silent

and patient auditors, however, were better informed. The ancient custom requires that the nations who have been comforted shall return a suitable response and acknowledgment. Once more the Condoling Song was commenced—this time from the eastern corner. Chief Skanawati led the chant in a high, clear voice. In the chorus the sweet musical notes of the blind Kanyadariyo and the deep bass voice of his father, Atotarho, could be heard. Twenty strong male voices mingled their powerful harmony, swelling and falling like the moan of a wind rushing through the forest. As thus chanted, the "hymn" became exciting; and I now understood why it was known among them as the "Stirrer" or "Rouser."

Skanawati, who was seated on the upper bench, next to the wall, now rose, and holding in his hand one of the wampum strings which he had received from Montour, expressed the thanks of the elder nations for the sympathy of their younger allies—their "offspring," as he termed them. He then repeated in due order each topic of consolation, to show that it had been duly weighed and appreciated. As he closed each section thus recited, he handed its indicatory string, or knot of strings, to an attendant, who bore it solemnly down the hall, and replaced it in the hands of Chief Montour. This repetition was made in the same brief and sharp sentences, and the same high artificial tones, which had marked their original delivery. It occupied nearly as much time, and still the patience of the motionless audience seemed unexhausted.

At length, however, the speaker's voice abruptly ceased. He took his seat, and a slight movement was apparent throughout the assemblage, such as occurs in a meeting for public worship when the regular services are closed, but some other ceremony is expected to follow. It was now growing dark, and some young men proceeded to light the lamps in the sconces which were ranged along the walls of the room. The light brought out the scene more vividly than before—the lines of swarthy, impassive faces, the motionless figures, the gay dresses of the women, and the dull hues of the opposite benches. There was a general air of expectation, and all eyes were turned towards the corner where the chiefs of the senior nation were seated. Presently Skanawati again rose, and, leaving his seat, took his post near the eastern end of the hall. Addressing the chiefs of the junior nations, he said that they had called upon the nations who had lost their councillors to bring forth the candidates who were expected to replace them. On behalf of the Onondaga nation, he would now offer them one to take the place of his brother, Rononhwirehton (George Buck), or, as he pronounced the name in its Onondaga form, Hononhwiehti. A young man of intelligent aspect came forward and stood by the side of the orator, who proceeded to say that the family of the deceased chief, represented by their "Chief Matron," considered that they had no member better qualified for the office than the man whom he now presented to the Council. He was young, but they believed he had

good natural abilities, and that he would, with the experience he must soon acquire, be able to fulfil the duties of the office properly, and become a useful member of the Council. Skanawati spoke in his ordinary tones, and in the manner of a sensible man of business addressing a public association. At the close of his remarks, the chiefs of the younger nations responded by expressions of assent.

A similar ceremony ensued with the successor of the Seneca chief, known in English as John Burnham (or Burning), who bore the title of Sadekaronhies ("As Long as the Sky")—the name of one of the six great leaders who framed the original League of the Five Nations. Then followed two proceedings which showed in a good light the practical working of their legislative system. The chief who held the eminent title of Tekarihoken, the first on the Council roll, was unable or disinclined to perform any longer the duties of a councillor, and had declared his desire of retiring. Chief Skanawati now proposed that the Council should accept his resignation and appoint a successor. As it chanced, however, there was no member of the family to whom the title belonged old enough to undertake the duties of a councillor. Under these circumstances, it was necessary to appoint some person of another family, but of the same nation (the Mohawk), to hold the office temporarily. The choice being now comparatively unrestricted, it might be presumed that a well-qualified person would be selected. In fact, the candidate proposed as the *locum tenens* was a middle-aged man of very intelligent aspect—one who, judged merely by his appearance, would have been a desirable acquisition to any deliberative assembly. He was well received by the chiefs to whom he was presented.

Skanawati then announced that the Council had found it necessary to exercise the right which it possessed of deposing an unworthy member. A chief had been proved guilty of selling intoxicating liquor on the Reserve. This was a breach of the law, and a public injury, and the Council had decided to degrade and expel him, and to appoint his assistant chief in his place. This announcement was received with the usual expressions of assent, and the leader of the administration—which is evidently Skanawati's position—quietly returned to his seat.

The leader on the other side, Hadwennine (Sheriff Wage), then rose and observed that it was the desire of the nations for whom he spoke, that he should welcome the newly received members and give them some instructions as to their duties. He requested them therefore to come forward. The three new members (the promoted chief not being apparently regarded in that light) advanced into the middle of the room, and stood there in a row, the two younger men looking rather sheepish under the concentrated gaze of the assemblage. The orator then addressed them in a speech of considerable length. They were told that as they were now members of the Great Council of the League, it would be their duty to learn the rules and forms of the Council, and to conform to them.

They must always bear in mind that the Council was constituted for the good of the whole confederacy. They should put aside all thoughts of self in their public acts, and should think only of the good of the whole people, and not merely of the people who were now living, but also of those who would come after them. If they acted on this principle, they would find, when they arrived at the close of their labours, that they had won the gratitude and affection of their people, and, more than this, those who came after them would bless their memory.

These sentiments, modern and democratic as they seem, are in precise accordance with the Book of Rites, especially in its Onondaga portion, and are doubtless in substance the same exhortations to which newly inducted members of the Council have listened from time immemorial. When the speaker had closed his fatherly admonitions, the new members took their seats among the chiefs of the senior nations, and the business of the Council was concluded.

Chief Skanawati presently arose and remarked that the banquet would soon be forthcoming, and if, in the meantime, any person present desired to address the assembly, an opportunity was now offered. I felt tolerably certain that the occasion would be improved, for these Indians, like my New England compatriots and the Scotch, have an insatiable desire for making and hearing addresses on moral questions and things in general. Presently an Onondaga chief, Johnson Williams (*Tehatkwarayen*), a middle-aged man, with a clear-cut, intellectual countenance, and a self-possessed and somewhat humorous expression, arose and remarked that if some of the younger people present were becoming a little impatient it did not at all surprise him. As everyone knew that after the feast there would be a dance, it was natural to suppose that the young men and maidens would look forward to it with more satisfaction than they had received from the impressive speeches they had just heard. A murmur of laughter which ran along the front benches showed that the speaker had here made a hit. He warned them, however, that they should be careful to conduct all their amusements with moderation and propriety. Especially they should see that no strong liquors were introduced. It would be contrary to their laws, and a great injury to the cause of order and morality. He hoped that if any ill-minded person should attempt such a thing, whoever knew of it would take care to have him exposed and punished. He added some further words of exhortation, which were received, like all the other speeches, with silent attention, and he took his seat as the heralds of the feast appeared.

These were two strong young men, who bore on their shoulders a stout pole, to which were suspended, between them, two large iron kettles, that sent forth an appetizing odour. These kettles contained the "corn-soup," or broth of Indian corn, in which the meat had been boiled. One of the kettles was set on the floor at each end of the hall. Two other

youths brought in the meat on large wooden trenchers. The venison of former days was now replaced by beef, which, it is only just to say, for flavour and tenderness did credit to the caterers. Although I had been present at a somewhat similar feast on a former occasion, after a dance at the "green-corn festival," I had felt some curiosity to see how the large company now present—numbering nearly three hundred—would be comfortably fed, without dishes or other appliances. On the former occasion most of the guests had brought their tin pannikins or basins with them, but here there was nothing of the sort. The hosts, however, understood their business. A dozen large flour-sacks were brought, filled with loaves of good wheaten bread. Several of the younger chiefs, including my friend, the interpreter, drew forth their knives and set to work to cut up both bread and meat into generous slices, adapted to appetites which had undergone the strain of eight mortal hours of song and oratory. After the Virgilian fashion, the fragment of bread formed a dish, on which the section of meat was laid, and thus, delicately enough, each guest received his or her portion. Then followed pails of very good lemonade, which was carried round and served, with glass goblets, to each person present. They did me the honour of presenting the first glass to me, as the principal guest. Those who wished for corn-soup went to the kettles and took it with the dippers or ladles which were provided for the purpose. The whole company, now much increased by a crowd of young people who had come in when the provisions appeared, was served in a surprisingly short time, and without the slightest disorder. The young chiefs and other attendants did their ministering deftly and quietly. The people kept their seats, and conversed in subdued tones. No public dinner or tea-party of their fastidious white neighbours was ever conducted with more propriety and good-breeding than this simple banquet of these self-respecting children of the soil.

It was now getting late, nearly eleven o'clock, and at the conclusion of the supper most of the elders and the children quietly withdrew. The younger men and women remained, and the removal of the kettles and some of the benches showed that the dances were about to begin. As I had seen this performance under more favourable circumstances, I did not wait for it, but summoning the faithful Peter, whose smiling face showed his perfect enjoyment of the occasion, I took leave of my friend Skanawati, who remained at his post as "master of the feast," and sought our conveyance in the neighbouring grove. As we were preparing to start, the loud chant of the musicians, the rhythmical beat of the tortoise-shell rattles, timing the dance, and the vigorous stamp of manly feet upon the well-worn floor of the hall, announced that the social amusement with which the Indians delight to finish their councils had begun. For some distance on our way we could see the lights gleaming brightly through the windows of the Long-House, and hear the musical clamour of the merry-making chorus.

Since the "Condoling Song" or rather Hymn, as it should perhaps be more properly styled, which has been frequently referred to in the foregoing narrative, may help to cast light upon the character and institutions of the Iroquois people, a fuller account of it will not be deemed out of place. The frequent recurrence of this hymn in the solemn rites of the Condoling Council may, without irreverence, be compared to the frequent repetition of the Lord's Prayer in the services of most of our Christian churches. And as the Prayer may be said to indicate the religious and moral traits to which Christians are expected to aspire, so the Condoling Hymn may be deemed to show the qualities which the Iroquois people most esteem in their social and political life. These qualities are in reality widely different from those commonly ascribed to them in our ordinary histories. In these the Indians in general, and the Huron-Iroquois in particular, are represented as a race of fierce and cruel ravagers and murderers. But, as I have said in another place, "the circumstances under which the red and white races have encountered in North America have been such as necessarily to give rise to a wholly false impression in regard to the character of the aborigines. The European colonists, superior in civilization and in the arts of war, landed on the coast with the deliberate intention of taking possession of the country and displacing the natives. The Indians were at once thrown on the defensive. From the very beginning they fought not merely for their land, but for their lives; for it was from their land that they drew the means of living. The Indians must be judged, like every other people, not by the traits which they display in the fury of a desperate warfare, but by their ordinary demeanour in times of peace, and especially by the character of their social and domestic life. On this point, so far as regards the Huron-Iroquois tribes, the testimony of missionaries and of other competent observers who have lived among them, is uniform. At home these Indians are among the most kindly and generous of men. Constant good humour, unfailing courtesy, ready sympathy with distress, and a truly lavish liberality, mark their intercourse with one another. The Jesuit missionaries among the Hurons knew them before intercourse with the whites and the use of ardent spirits had embittered and debased them. The testimony which they have left on record is very remarkable. The missionary Brébeuf, protesting against the ignorant prejudice which would place the Indians on a level with the brutes, gives the result of his observations in emphatic terms. "In my opinion," he writes, "it is no small matter to say of them that they live united in towns, sometimes of fifty, sixty, or a hundred dwellings—that is, of three or four hundred households; that they cultivate the fields from which they derive their food for the whole year; and that they maintain peace and friendship with one another." He doubts "if there is another nation under heaven more commendable in this respect" than

the Huron "Nation of the Bear," among whom he resided. "They have," he declares, "a gentleness and affability almost incredible for barbarians." They keep up "this perfect goodwill," as he terms it, "by frequent visits, by the aid which they give one another in sickness, and by their festivals and social gatherings, whenever they are not occupied by their fields and fisheries, or in hunting or trade." "They are," he continues, "less in their own cabins than in those of their friends. If any one falls sick, and wants something which may benefit him, everybody is eager to furnish it. Whenever one of them has something specially good to eat, he invites his friends, and makes a feast. Indeed, they hardly ever eat alone." Of the Iroquois the missionaries give accounts which are precisely similar, and therefore need not be quoted.

The keynote of the hymn may be said to be struck by its first line, which consists of but two words, though these require several words of English to translate them. The two words are "*Kayanerenh teskenonhweronne*," which are commonly translated, "We come" (or rather "I come," the speaker being understood to represent his whole party) "to salute the League." This rendering, however, is really inadequate The word *kayanerenh*, as has been already said, means properly "peace," in which sense it is used throughout the Iroquois version of the English prayerbook, in such expressions as "the Prince of Peace," "give peace in our time." Here it is a contracted form of th longer term *Kayanerenh-kowa*, "Great Peace," which is the regular and, so to speak, official name of their league or constitution. Thus the speaker, or rather singer, begins by saluting the League of Peace, whose blessings they enjoy. The next following word, which is often repeated in the hymn, has been deemed important enough, as characteristic of the language, to deserve a fuller analysis.[1] "*Teskenonhweronne* is a good example of the comprehensive force of the Iroquois tongue. Its root is *nonhwe* or *nonwe*, which is found in *kenonhwes*, I love, like, am pleased with—the initial *ke* being the first personal pronoun. In the frequentative form this becomes *kenonhweron*, which has the meaning of 'I salute and thank,' *i.e.*, I manifest by repeated acts my liking or gratification. The *s* prefixed to this word is the sign of the reiterative form—'*again* I greet and thank.' The terminal syllable *ne* and the prefixed *te* are respectively the signs of the motional and the cis-locative forms—'*I come hither* again to greet and thank.' A word of six syllables, easily pronounced (and in the Onondaga dialect reduced to five), expresses fully and forcibly the meaning for which eight not very euphonious English words are required. The notion that the existence of these comprehensive words in an Indian language, or any other, is an

[1] This passage from my "Iroquois Book of Rites" has been quoted in my essay on "Language as a Test of Mental Capacity," in vol. ix. of these Transactions. As it properly belongs to the present paper, I have ventured to repeat it here.

evidence of deficiency in analytic power is a fallacy which was long ago exposed by the clear and penetrative reasoning of Duponceau, the true father of American philology. As he has well explained, analysis must precede synthesis. In fact, the power of what might be termed analytic synthesis—the mental power which first resolves words or things into their elements, and then puts them together in new forms—is a creative or co-ordinating force, indicative of a higher natural capacity than the act of mere analysis. The genius which framed the word *teskenonkweronne* is the same that, working with other elements, produced the steam-engine and the telephone." Elsewhere I have said that "the wealth of forms and the power of expression in the language have impressed every student. Two hundred and fifty years ago the scholarly Jesuit, Brébeuf, compared it to the Greek, and found it in some respects superior. In our own day this opinion has been reinforced by an authority of the greatest weight. Professor Max Müller, who learned the language from a Mohawk undergraduate at Oxford—now an esteemed physician in Canada,—has written of it in terms of singular force. To his mind, he declares, the structure of the language 'is quite sufficient evidence that those who worked out such a work of art were powerful reasoners and accurate classifiers.' Powerful reasoners and accurate classifiers! To appreciate the full strength of these expressions, we must consider whether they could be properly applied to the framers of the great classical tongues of the old world, the Aryan and the Semitic; and we must honestly decide that they could not. The irrational and confused gender system of the Aryan, and the imperfect tense system of the Semitic stock, must exclude them from the comparison. It is a noteworthy fact that the two foremost philologists of Europe and America, Max Müller and Whitney, both devoted students and admirers of the Aryan speech, have compared that speech in its highest developments with the leading American tongues, and both, though differing widely in their linguistic theories on other points, have pronounced in the strongest terms their opinion of the structural superiority of these American languages."

In the next line of the hymn the singer greets the chief's kindred, who are the special objects of the public sympathy. Then he salutes the *oyenkondonh*, a term which has been rendered "warriors." This rendering, however, may have a misleading effect. The word has nothing to do with war, unless in the sense that every grown man in an Indian community is supposed to be a soldier. Except in this hymn the word is now disused. It is apparently derived from *onkwe* (which in one dialectical form becomes *yenkwe*), meaning simply "man." It comprises all the men (the manhood or man-kind) of the nation, as in the following verse the word *wakonnykih*, which is also obsolete, signifies all the women of the people. If there are any barbarians by whom women are treated as

inferiors and made "beasts of burden," the Iroquois are not to be ranked with them. Among them women are held in high esteem, so much so, indeed, that on the death of a chief the women of his family are left to select among his kindred the person whom they deem best qualified to succeed him; and the person whom they choose is rarely rejected by the Council. In the next line the singer invokes the laws which their forefathers established, and he concludes by calling upon his hearers to listen to the wisdom of their forefathers, whom he invokes as if present. As a whole, the hymn may be described as an expression of love of peace, of reverence for the laws and for the dead, and of sympathy with the living. Such is the "National Anthem"—the "Marseillaise"—of the terrible Iroquois.

The lines of the translated hymn have been cast into the metre of Longfellow's "Hiawatha." The version in these lines, however inadequate, will give a better idea of the true force of the original than a bald literal translation. We are to imagine, in the singing, that each line is twice repeated, and is followed by many ejaculations of *Haih-haih!* "All hail!"

> "To the Great Peace bring we greeting!
> To the dead Chief's kindred, greeting!
> To the strong men round him, greeting!
> To the mourning women, greeting!
> These our grandsires' words repeating,
> Graciously, O Grandsires, hear us!"

It may well be understood that these condensed expressions of feeling, striking such varied chords of emotion, and uttered amid impressive surroundings, such as may be inferred from the foregoing narrative, must in former times have produced an extraordinarily powerful effect—as even at the present day, under widely different circumstances, they retain an influence of singular force and persistence. The whole detail of the Condoling Council indicates a frame of polity constructed with consummate skill to include all the methods which experience and reflection had led the founder (and also, as Morgan has suggested, some of his successors, improving on his plans) to deem most effective in establishing and strengthening a state. These were, first, a legislature, or general council, comprising two distinct elements—the one a conservative aristocracy, hereditary in certain families, and constantly renewed and kept vigorous by the clear insight of female suffrage; the other a selected class of non-hereditary councillors, holding both advisory and executive powers,—and the whole system so conditioned as to preserve to the people the utmost democratic freedom and personal equality of rights before the law; and, secondly, institutions of local self-rule, jealously maintained in the several tribes, but combined in a strict federal alliance, and this alliance so devised as not merely to allow but openly

to invite indefinite expansion, with the deliberate purpose of including all nations in a league of universal peace. These are methods and forms all now to be seen in actual existence and operation, and all confirming the positive and unquestionable tradition which ascribes their origin to one master mind, endowed with transcendent genius, forethought, and benevolence. Yet it is clear that the beneficent genius of Hiawatha would have been unavailing if it had not been seconded by the remarkable intellectual and moral qualities of his people — a people whose achievements, institutions, and language show them to have been, in natural capacity and the higher elements of character, not inferior to any race of men of whom history preserves a record.

III.—*The Present Position of American Anthropology.*

By THE REVEREND JOHN CAMPBELL, LL.D.

(Read May 16th, 1895.)

Every science is in danger of being discredited by the vague theories of early investigators into the problems which its subject matter presents. Such has been the case with studies regarding the nature and origin of our aborigines, and that so signally as almost to have brought the labours of the Americanist into contempt. The connection of these aborigines with the lost tribes of Israel has long been abandoned, and their association with the Mongols of Kublai Khan has now hardly a defender, but occasionally an advocate of a Chinese original airs his views, and otherwise wise men put faith in Plato's mythic Atlantis. Necessarily the first stage of every science is one of speculation on the basis of a few carelessly observed phenomena. These phenomena furnished a starting point which was straightway, according to the reasoning of our grandfathers, converted into a logical premise major or minor; the corresponding second term was found in the peculiarities, histories or traditions of certain Old World peoples; and the conclusion was drawn with a dialectic certainty that despised fact. Many years ago a great revulsion set in against this method in the line of Voltaire's dictum that, as God made America's flies, He could also make her human beings. Hence the Bureau of Ethnology at Washington, which more than any other institution, has worked in the department of American anthropology, pays little heed to speculation, and the associated Americanists of Europe act largely upon the principle, America for the Americans. Yet it must be evident to all students of comparative philology alone that this principle is a false one, since its application in the case of Europe, Asia and Africa would have deprived science of its classifications of the Indo-European, the Ural-Altaic, and the Mbantu families of languages and peoples. The broadest extent of anthropological knowledge is quite compatible with the most minute and comprehensive intent of one of its sections. The student of our Canadian flora, for example, is not at liberty to treat that of the rest of the world with contempt, for his acquaintance with its orders and alliances is incomplete without some knowledge of the links furnished by the botanical observations made in other lands.

The days of Agassiz are gone by and few now believe in faunal and floral centres, including six protoplasts of American man. Theories of evolution, which have largely displaced his belief, can find no basis for the

development of the human species on this continent, seeing that it is deficient in anthropoid apes, although one worthy naturalist suggested that the bear, which, on the defence, assumes an erect form, might furnish man with a fitting progenitor. The profession that tribes and nations in all ages make to have been autochthonous are no more to be believed now of the Mohawks than they were twenty-five centuries ago of the Athenians. Almost all peoples come in time to associate their traditions with the scenes of their present home. It is morally certain that the Chinese originally dwelt in Babylonia, and that the Japanese once dwelt in northern India, but all their traditions, even their histories, are located within the bounds of their present empires. There is no physical peculiarity in which all American Indians of pure blood agree with the exception of their straight black hair, and that is common to all pure blooded Turanians, excluding Negroes and Papuans, in Europe, Asia, Africa and Polynesia. A great deal has been made of American languages under the term polysynthesis, but, as a matter of fact, a very large number of our aboriginal tongues are not polysynthetic, while some are almost monosyllabic, and the polysynthesis of America has its exact counterparts in Turanian-Europe and Asia and in the Tagala and similar dialects of the Malay. Professor Max Müller has protested against making polysynthesis a characteristic of any linguistic group, and MM. Jules Vinson and Lucien Adam have shown that American speech is not by its means differentiated from that of the rest of the world.

To the casual observer all Indians, dressed in the shabby clothes of the white man, unkempt and unobtrusive, may look alike, so that the generic name Indian or Red Man does duty for each and all; but our aborigines themselves and those who have lived among them in their native condition know better. No such an one would mistake an Eskimo for a Déné, a Déné for an Algonquin, or an Algonquin for a Dakota or Iroquois, any more than he would confound an Aztec with a Maya, or a Quiche, or a Chinook with a Haidah. Indeed, with scientific investigators the great difficulty is not that of differentiation but of integrate classification. This classification proceeds almost entirely on the basis of language, in spite of the vast variety of American dialects. Chateaubriand gives a peculiar character to the courtly Huron as distinguished from the savage Iroquois, his enemy and almost his exterminator, but it has long been well known that the two peoples are next of kin. The beloved people of the Cherokees, as Bancroft terms them, used to be regarded as a clan by themselves, till attention was drawn to a suggestion by Adelung in the Mithradates, when Mr. Horatio Hale exhibited the radical unity of their language with that of the Huron-Iroquois. This work of classification is far from complete as yet. One of the families most abundant in dialects past and present is the Algonquin which has great representation in Canada, embracing the extinct Beothik of New-

foundland, so well set forth by the Rev. Dr. Patterson, and the Blackfoot of the far west. Yet Father Morice, in his enumeration of the many tribes of the Dénés called by Mr. Pilling of Washington, Athapascans, tribes that extend from the Eskimo area far into Mexico, includes among them the Sarcees who form part of the Blackfoot confederacy. So, in ancient times, the Delawares, who are pure Algonquins, were adopted into the league of the Iroquois. It has been found that the Aztec language of Mexico does not stand alone, in spite of its peculiar *tl* syllable, but, with the Nicaraguan dialects, takes those of Sonora and the Shoshonese or Paduca family farther north into its alliance, while the Pueblo forms of speech are not alien to it. Classification looks in the direction of establishing the relations of all our aboriginal languages with two or at most three linguistic stems. Two of these are now certainly known.

In matters of dress, shelter and conveyance, implement and ornament, manners and customs, the Indian whatever his original derivation, has adapted himself to the condition of his American home, and has copied from his fellow what he has deemed most appropriate to it. In some of the Pacific States, in Mexico and in Central and South America, some tribes go entirely naked, a fact in itself suggestive of a South Sea origin, as is the meagre attire of some of the aborigines of British Columbia. But tribes of the same origin, forced into inclement regions and into the society of clothed savages, speedily adopted garments of the skins of wild beasts with the fashion of which their own ancestors were altogether unacquainted. The coronet of large bird feathers, according to all analogy, was of Polynesian origin, and appears in all its integrity on the head of Powhatan in Captain John Smith's history, but it caught the fancy of some of the Dakota tribes, as worn by Blackfeet or other Algonquins, and Catlin shows how the Crows availed themselves of it to the advantage of their personal appearance. The bark of the birch tree is a Siberian product, and has long been used in that northern country for the coating of summer houses, the building of canoes, the manufacture of boxes and baskets and for writing purposes, as well as for the protection of dead bodies buried in mounds. Many tribes that came to America never saw Siberia nor a birch tree, but they were quick to perceive the superiority of the light birch canoe over the heavy dug-out, and the adaptability of its material to the above mentioned ends, thus becoming copyists of those whose education had been Siberian. Indians as diverse in origin and character as the Dénés and Dakotas, the Crees and Blackfeet, who inhabit prairies and plains, have become quite accustomed to the use of the horse. With the exception of some coast tribes that are simply fishers, a few of which venture to attack the whale, all our Indians are hunters, although in the original abodes of many of them game must have been scarce and small.

The luxuriant vegetation of the Pacific islands renders pottery unnecessary, its place being supplied by joints of the bamboo, by gourds and the shells of cocoanuts ; but the ceramic art of the Turanian areas of northern Europe and Asia used to be, probably where exercised is still, of the same nature as that of this continent, such as has been exhumed from many mounds and as is still manufactured by the Pueblo Indians of New Mexico. According to tradition, the Algonquins were not originally potters and rarely practised the art, but some of them copied the practice from adjoining tribes. The use of wampum and of ornamentation in beads, originally sections of hollow shells, looks like the device of a maritime people, and many Algonquin tribes are adepts at it, yet in the transactions of the Imperial Society of Geography at St. Petersburg, are found coloured illustrations of Siberian bead ornaments, in design and general character identical with those so familiar in Canada. Scalping was a custom of the Northern Scyths in the time of Herodotus, and was almost universal in North America, but decapitation, judging from the practice of the Beothiks, was the original Algonquin substitute for it, as it is among the Malay-Polynesians, whose head-hunting is notorious. This same head-hunting prevailed among the Huastec-Maya-Quiche tribes of Central America, and among the Caribs and similar tribes of the southern continent. Loan arts and customs have done much to obscure the relations of different tribes and make aboriginal archæology very much the same throughout the whole of America. Even the implements of the western coast tribes mediate between the stone of the Aleutian water-men and the wood and fish-bone of the Pacific islander of the South.

Much has been written by the late Colonel Garrick Mallery on the Sign and Gesture Language and on the Pictographs of the American Indians, but little attempt has been made to classify these or to trace their origin. The same is the case with Dr. Yarrow's Mortuary Customs. Lewis Morgan's valuable treatises on Indian clans and relationships, and on aboriginal houses and house building exhibit the same tendency to set forth the native American as one species, and level up or down all differences in kinship and architecture. Longfellow's Hiawatha, which, beautifully mixes up, in a measure borrowed from the Fins, the mythology of the Iroquois, Dakotas, and Algonquins, is a type of aboriginal studies in general, largely made without that respect of persons which is absolutely necessary to exact science. Extensive explorations have been made of ancient seats of civilization, and much has been written on the architectural remains of Peru and Central America, of Mexico and the Southern Pacific States. The cyclopean walls of old Peruvian cities rival those of Tiryns and Mycenæ, yet without any Greek feature. The Stonehenge of Tiahuanaco, supposed to have been set up among the ancestors of the still living Aymaras, in a single night by an invisible hand, claims kindred with that of Wiltshire in England, and that of

Kasseem in Arabia. The stone buildings of Central America, such as those of Copan, Palenque, Uxmal, and Chichen-Itza, as well as some within the area of Mexico proper, are distinct in character, and have been compared with such oriental remains as the temple of Boro-Bodo in Java, while their cartouche-like hieroglyphic groups exhibit relationship with the characters of the Easter Island inscriptions. The analogues of the Mexican pyramids and other stone structures may be found in ancient Japan, but the Casas Grandes, towards the borders of the United States, built of adobe or unburnt brick, were one not assured of their antiquity, might very well be placed to the credit of the conquering Spaniard. Pueblo architecture differs little from that of the walled villages of Tartary and the other aboriginal outlines of towns in Bashan and the Hauran. Finally, the cliff dwellings, high up in the rocky ledges of the western canyons, carry one back to the abodes of the Kenites in Mount Hor, who put their nest in a rock.

In Oregon and Washington and in British Columbia the mound-building area begins, and extends eastward into western Ontario, its chief extent in the United States being from Dakota to the Atlantic, southward to the Gulf of Mexico and Florida. Professor Cyrus Thomas's elaborate report, constituting the transactions of the Bureau of Ethnology for 1890-91, does not touch upon the mounds of British Columbia and the Northwestern States, but, beginning with Manitoba and the Dakotas follows the track of their builders east and south. Many of these mounds are small affairs, built solely for purposes of interment. Others, again of large size and very varied design, were simply raised platforms for a wooden architecture that has long crumbled into dust. Similar artificial mounds exist in the Japanese islands, in Corea and northern China, and throughout Siberia, clustering most thickly about the River Yenisei. They are also found in Tartary, in northern India, in parts of Persia and in the Caucasus, as well as throughout the whole of Syria. The Siberian mounds, the only class in the Old World that has been systematically explored, are identical in character with those of America, the chambered tumuli used for interment being of the same nature even to the layers of birch-bark spread over the body of the dead. Professor Thomas and Major Powell are both agreed that the mounds of America are of no very great antiquity, and that they were the work of the ancestors of existing Indian tribes that dwelt in the vicinity of their sites when the white man first became acquainted with them. When, however, these authorities limit the culture of the Mound-Builders to that which prevailed among the Indians at the beginning of European colonization, they either rate the latter more highly than early travellers indicate it to have been or depreciate the evidence of mound contents illustrative of considerable pictorial skill in gold and copper work and of much agricultural and commercial activity.

Half a century ago, Mr. John Macintosh, of Toronto, published a little book containing extracts from the writings of Santini and other travellers among the tribes of Siberia relating to their appearance, dress, warfare, religion, games, manners and customs, and paralleled these extracts with accounts of the American Indians published by well-known authorities. Humboldt in his day, and within a comparatively recent time, Commodore Perry's journalist, pointed out striking coincidences between Japanese custom, science, and art and those of the Northwestern peoples of South America. Lately, Mr. Kennan, in his "Tent Life in Siberia," identified our Indians in general appearance with the Koriaks and Tchuktchis of that country; and, but the other day, Mr. Frank G. Carpenter found American features in Corea and Japan. Many Japanese junks have been driven to the Pacific coast of this continent within modern historical time, and some of their crews have taken up their abode where their vessels grounded. One feels, however, that such isolated facts and general coincidences, while sufficient to stimulate inquiry, are not ground enough for the foundation of a scientific dictum. Mere physical resemblance proves little, inasmuch as, in this continent, even among peoples whose languages show them to be closely related, there is often found a very great variety of formation and feature. Our aborigines have short heads, long heads and flat heads, and brains of a great variety of capacities. We have tall Dakotas and Patagonians, and stunted Eskimos and Fuegians. The civilized Peruvians and Mexicans appear to have been men of Japanese stature; while, judging by the Palenque Tablet of the Cross, the Cachiquels, who belonged to the Huastec-Maya-Quiche family, possessed the large well-nourished frame of the better class of South Sea Islanders.

Coming to scientific demonstration, perhaps the first to definitely associate our Indians with Old World peoples by means of language was Dr. Latham, who said they had all their affinities with the Peninsular Mongolidæ, by which name he designated the Japanese and their related tribes. So far as the Algonquins, the Maya-Quiches, the Caribs, the Tupi-Guaranis and the Mbaya-Abipones are concerned, this is not true; therefore Dr. Latham must have had in view such tribes as the Dakotas, Iroquois and Choctaws. At the meeting of the first Americanist Congress, Professor Julien Vinson compared that isolated Turanian tongue, the Basque of the Pyrenees, with which he is thoroughly acquainted, with an Iroquois and two Algonquin dialects. He exhibited coincidences in grammatical construction, especially between the Basque and the Iroquois but failed to connect the vocabularies. Working on larger material than M. Vinson had at hand, I succeeded in discovering the laws of phonetic change or permutation of letters governing the relations of the Basque and the Iroquois, and the same were published in the Proceedings of the Canadian Institute. About the same time, an

honoured fellow of this Society, Mr. Horatio Hale, whether by the aid of my paper or not I have not heard, announced that the Basque and the Iroquois were members of the same family of speech, but drew the irrelevant conclusion that the Iroquois had come from Europe to America. This I confuted by showing, first of all, that the Basque stands in the same relation to a large number of American languages, including the Aztec-Sonora and the Peruvian groups, as it does to the Huron-Iroquois-Cherokee group, and secondly by exhibiting the wonderfully closer likeness to the latter of the continental branches of the languages of the Peninsular Mongolidæ, such as the Koriaks and Tchuktchis, the Yeniseians, Yukahirians and Kamtchadales, even in long compound words.

The relation of the Corean, Japanese and Aino tongues, as well as of the dialects of Loo-Choo and the Meia-co-shimas, to the languages of Siberia, excepting the Yakut Turk and the Ugrian, is well established As things that are equal to the same thing are equal to one another, it follows that Japanese, the best known of these forms of speech, must have extensive American relations. In its absence of polysynthesis and great simplicity of structure it resembles the Peruvian and the Sonora languages, with which its vocabulary is in general accord, but, on comparison with the Choctaw-Maskoki group, it appears that they, the Choctaw, Chickasa, Creek and Seminole, are virtually Japanese dialects. Thus the common Japanese words, *hito*, *kusa*, *foshi*, *suna*, *yubi* and *nitchi* by a common addition become the Choctaw *hattak*, *kushuk*, *fichik*, *shinuk*, *ibbak* and *nittak*. These dialects are to Japanese as English is to German, or the Romance languages to Latin. While generally agreeing in their Peninsular Mongolidæ resemblances, the Dakota dialects have peculiarities that intimately link them with the Aino speech of Yeso and Saghalien. Then the Basque and the Japanese are related? Undoubtedly they are, and the links between them are the Georgian, Lesghian, and other dialects of the Caucasus, and the varying speech of the aboriginal tribesmen of the Himalayas. The extinct languages of the Indo-Scyths, the Parthians, the Cappadocians, Phrygians, and Lydians, the Oscans, Samnites and Etruscans, the Iberians, the Picts, the Tuatha de Danans of Ireland, and the Silures of Wales belonged to the same great family to which I have given the name Khitan applied by the Chinese to that portion of their race which ruled the Celestial Empire for much more than a century.

Several years ago I succeeded in assigning phonetic values to the varying, yet radically similar, Turanian characters found on monuments of different kinds from Britain to India, and from India to the west of Nova Scotia. West of Syria the language they yield is archaic Basque, void of any polysynthesis, save that of the inclusion of the subject and indirect regimen pronouns with the two verbs substantive and active, and east of that region they yield archaic Japanese destitute of any

attempt at polysynthesis. With the western group of inscriptions we are not now concerned, but the eastern series has much to do with American origines. A study of the Buddhist inscriptions of India reveals the fact that the Buddhists, who were lords of northern India from the fifth century B.C., till at least the fourth A.D., were the Japanese and their congeners, and that the monumental facts are the data both of the Raja Tarangini or history of the kings of Cashmere and of the annals of the Emperors of Japan. The next series of inscriptions is the Siberian in a somewhat ruder script and in the same Japanese idiom. These begin with the fifth century A.D., and extend to the eighth, and they furnish the names and deeds of several Chinese Khitan kings and Japanese Dairis or Mikados, who appparently were never out of Siberia. Their Siberian empire had its centre about the Yenisei, and the name common to all their tribes was Kita as it was in India. In Klaproth's time a remnant still dwelt there whose name for an individual was Khitt or Hitt, and one of whose tribes was that of the Kenniyeng, meaning the same as the name of the Mohawks, Kanienke, the Flint people. Kita, Khitt or Hitt is the Japanese Hito, a man, and the American Choctaw Hattak.

Some Japanese tracings of inscriptions in the Siberian characters have been sent to me, but they are so defaced and fragmentary that, although their oneness with the Siberian is evident, they are virtually illegible. Doubtless more will yet be discovered in a more perfect condition. I have submitted specimens of the Indian and Siberian inscriptions, with key, transliteration, and translation, to the Canadian Institute, which has published many documents by me on the subject. Last year I contributed to its transactions a paper on Aboriginal American Inscriptions in Phonetic Characters. It dealt with two mound inscriptions from Davenport, Iowa, the Grave Creek stone from West Virginia, the Brush Creek stone and an inscribed effigy from Ohio, the Newburyport inscription from Massachusetts, and the Yarmouth rock of Nova Scotia. These seven inscriptions are all of the same character as those of the Yenisei, and that of the Yarmouth rock, the genuineness of which is incontestable, might have been copied, character by character, from the runes of Siberia, of the existence of which Nova Scotians and Americans generally are still in profound ignorance. The language the seven American inscriptions furnish is classical Japanese, and the dates recorded on some of them, reckoned from the *nirvana* of Buddha, ascend to the eighth century A.D. Some of their contents indicate that the tribes which once dwelt in Iowa and elsewhere along the Mississippi and the Ohio, gradually found their way south to Mexico.

The aborigines of America are not destitute of history. Cusick's "History of the Six Nations," Peter Dooyentate Clarke's "History of the Wyandotts," "The Iroquois Book of Rites," and the "Walum Olum of

the Delawares," contain rather material for history than history proper, like the far scattered inscribed stones. But in Mexico, Central America, and Peru, there are veritable histories in the form of chronicles, compiled from materials existing in oral or written tradition before the Conquest. The Maya, Quiche, and Cachiquel documents of Yucatan and Guatemala may be set aside for the present, and the Mexican and Peruvian annals of Ixtlilxochitl and Tezozomoc, of Garcilasso de la Vega and Montesinos, claim sole attention. From these we gather that the Toltec or oldest Mexican dynasty began to reign in 721 A.D., and that it was expelled to the south by the Chichimecs in 1064, the very year in which the Peruvian monarchy began. The Toltecs were the Durdukku of the Assyrian monuments, the Dardani of the Greeks, and their Incas of the four quarters were the descendants of the Anakim of Kirjath Arba, and of the same blood as the royal Anzis of the Loo-Choo islands. The annals of Japan and of these islands show that an enforced migration of this stock from Japan took place early in the eighth century, and it seems that, while part of the fleet that carried the exiles reached the Loo-Choo archipelago, the greater part was driven to the American coast, there to found the empire of the Toltecs. The Chichimec and Aztec tribes, the remnants of which are the Shoshones and the Utes of the Paduca family, coming down from some higher point at which they had struck the coast, fell upon their relatives of Mexico, who at the same time were their hereditary foes, and expelled them to the south after the middle of the eleventh century. Other invaders of Mexico, lured southward by reports of its wealth, were the Mound-Builders of the Mississippi and Ohio villages, whose progress from the north was also hastened by the pressure of tribes belonging to their own flesh and blood that had traversed the Aleutian chain and had made their way across half the continent.

Once more returning to language, Professor Cyrus Thomas has lately stated that the civilization and the tongues of the Huastec-Maya-Quiche peoples of Central America are of Malay-Polynesian origin. This I stated in several publications issued in Britain and America many years ago, and as firmly I now repeat the statement. Having studied more or less completely the structure of over six hundred languages and dialects, I found that their most radical difference lay, not in any mere accident of polysynthesis or phonetics, but in something far more radical, a diversity in the logical order of thought. We who speak English and French are so accustomed to our own syntax, and are so confirmed in it by our Greek and Latin, our Hebrew and even our Celtic studies, that we regard it as the normal mode of thought expression. But the Sanscritist discovers that what he has always supposed to be the cart frequently goes before what he has regarded as the horse, and, on reflection, finds that there are isolated cases of the same kind in Latin, in German, and even in English. The monosyllabic languages and the

Malay-Polynesian follow his native order, but the other Asiatic and European tongues called Turanian invert it, after the variations of the Sanscrit which has suffered much from Turanian admixture. Language is made up of two classes of terms, whether words proper or particles, and these two classes are the concrete and the abstract, in other words, terms denoting being and action, and terms denoting relation or quality. The Indo-European, the Celtic, and the Semitic mind give prominence or priority to the abstract; the northern Turanian, to the concrete. The preposition *in* is an abstract term, while *house* is concrete. We say, and all the people we know, say "in the house"; but the Basque and the Japanese say "the house in," making the abstract term a post-position. In Aramaic we say Bar-Nábas, the son of Nabas, in Gaelic, MacDonald, the son of Donald, in French le fils de Pierre; but in English and in all the Teutonic languages it is allowable to say Nabas's son, Donald's son, Peter's son. The latter, with or without the mark of possession, which is a post-position, is the Basque and the Japanese order. As the abstract is subordinated to the concrete, so is the generic to the specific term. Preposing languages occasionally postpone as the Sanscrit does largely. There may be exceptions to the converse, but they are so few that it may be said that postponing languages never prepose. This is the most valid distinction of forms of speech I know, and I wonder much that the collectors of foreign vocabularies have not had their attention called to it rather than to far fetched terms of kinship which link the useless with the oft impossible.

By far the larger number of our best known families of American speech are postponing, like the Basque and the Japanese; they never use prepositions, nor do they prepose other particles denoting relation. Some Algonquin dialects use post-positions occasionally, but their logical and common order is preposing, which essentially differentiates them from the adjacent Dakota, Iroquois, and Choctaw-Maskoki groups. Many years ago I published a paper, now become exceedingly rare, entitled "The Affiliation of the Algonquin Languages," in which I exhibited the radical unity of these dialects with those of the Malay-Polynesian area, both in grammatical forms and in vocabulary. Algonquin features, their taciturnity and rigorous etiquette with each other, their lacustrine and fluviatile habits, their insular heaven, their creation from vegetable forms, their Manitou, which is just the *anito* or spirit of the Malay Archipelago with prefixed article, their head-hunting, lack of pottery and similar manufactures, failure to worship the sun, all combine with their language to show that, wherever they first landed on the American coast, they so landed at some remote period in large war prahus from the islands of the Pacific. What resemblance they now present, in appearance and dress, in arts and customs, to a certain extent in language, to neighbouring tribes, has been the result of long contact with them.

I have already said that Professor Cyrus Thomas now agrees with me in regarding the Huastec-Maya-Quiche family of Central America as of the same origin. Their dialects are very simple and are all preposing. At the last meeting of this Society, the abstract of a paper by me was read in which I furnished the first decipherment yet made of certain documents written in their peculiar hieroglyphic, the nearest form of writing to which is found on Easter Island in the Pacific. In that paper I have indicated the purely Malay origin of the Mayas, Quiches and Cachiquels of Yucatan and Guatemala to which the personal appearance of these peoples, their religion and mythology, arts and customs. testify. The Abbé Brasseur de Bourbourg and Dr. Brinton of Philadelphia have translated the Maya chronicles and those of the Quiches and the Cachiquels, so that they are now accessible to every reader of French and English. The inscribed monuments translated by me have no great antiquity, belonging to the early part of the fifteenth century; but there is every reason to think, from the displacement of the family to which they belong to the eastward by the Mexicans, that they preceded the fugitives from Japan in their occupation of the American coast. Other members of the same family were driven farther east into the islands of the Gulf of Mexico and the Caribbean Sea, where Columbus found them.

Many tribes of South America now dwelling in the eastern parts of that continent had a similar origin, as their languages and customs testify. Such are those that constitute the Mbaya-Abipone family of the Gran Chaco whose vocabulary and grammatical forms, as given in the earliest notices of them, are almost identical with those of the Friendly or Tonga islanders. The Tupi-Guarani family of Brazil is very different and seems to claim kindred with the semi-Papuan peoples whom the Fijians best illustrate. There are Papuan remnants in the Malay Archipelago and all the way south to Australia, whose postponing grammar and lexical peculiarities differentiate them from the true Malay-Polynesian. It does not follow therefore that a postponing language always denotes a northern Asiatic stock, so that the philological ethnologist in America will do well to make himself acquainted with the peculiarities of Papuan speech as found in New Guinea, the New Hebrides, and in Australia. Some of our west coast tribes have a Papuan air, and while employing many Malay-Polynesian terms acquired by long contact, speak languages that indicate a different source. A general acquaintance with the Japo-Siberian, the Malay-Polynesian, and the Papuan dialects is not a serious undertaking for an earnest student of American origines, and by acquiring it there is little doubt of his being able to solve all the main problems connected with our Indians. Japanese and Corean grammars and lexicons are now easily procured, while recent works in the line of Klaproth's Asia Polyglotta will give an insight to

the Siberian members of their linguistic family. Grammars of the Malay or Javanese, of Tahitian, Samoan or Tongan, of Efatean or Australian, and such collections of words as those in Crawford's and Wallace's Indian Archipelago, and in Mr. Horatio Hale's Ethnology and Philology of the U.S. Exploring Expedition will complete the outfit for a comparative study of the languages of the Old World and the New.

The records of the Siberian monuments, the histories of Japan and the Loo-Choo Islands, the brief documents of the Mound-Builders, and the chronicles of Mexico fix the arrival of the exiles from Northern Asia to the shores of this continent in the early part of the eighth century. The displacement of the tribes of Malay-Polynesian origin by them and their successors indicates that the islanders must have preceded the men of the north in the occupation of American soil. This is confirmed by the fact that there are no traces of Hinduism among the American tribes of oceanic derivation, an influence which made itself felt at least as early as the fifth century in the islands of the Malay Archipelago nearest to India. In that century began the pressure of numerous and warlike bodies upon the civilizations of the East and of the West. There were no Goths nor Vandals in the East but there were Indo-Scyths, Avars and Huns, who created great displacements of population both in northern and in southern Asia, and when the alternative was offered the weaker parties of exile or extermination at the hands of the conquerors, it is not to be wondered at that, in the large and well-provisioned junks and war prahus of ancient days, thousands of fugitives committed themselves to the mercy of the waves, and, by the same process that peopled the Loo-Choos and the Meia-co-shimas, and gave inhabitants to Madagascar, New Zealand, and the Sandwich Islands, found their way to the more distant American shore.

Our Indians are no new unsophisticated race or races in whose persons and achievements the problem of social evolution may be studied. They are the remnants of great nations long grown old and almost faded out of memory. Their divine, regal and princely names, such as Tockill and Tammany, Huascar, Yupanqui, Montezuma, Hiawatha and Tharonhiawakon, are Old World names disguised, names of men who held regal sway in Babylonia and Assyria, in Palestine and in Egypt, when the Semite was of little account and the Aryan was hardly heard of. The history of our American peoples, in so far as we can recover it, is the key to the ancient history of the world when Turanian and sub-Semitic races were kings of men. Their position now, relative to what it was in antiquity, is like that of Dr. Schliemann's palæolithic find at Hissarlik just above Priam's Treasury of Ilion. The Siberian civilization of the Mound-Builders, the Japanese civilization of Mexico, New Granada and Peru, had they been fostered instead of destroyed by Spanish and other invading hands, might have emulated those of more favoured regions,

and have risen to the old level of the Tiglaths and the Amenophids in Assyria and Egypt, but the Spaniard was not altogether to blame. United they could have swept him and all other invaders back into the ocean by overwhelming force of numbers and by undoubted courage. Their own dissensions slew them ; the same internecine strife that drove them across the Pacific, living in their souls as an endless vendetta, made them an easy prey. Now, doubtless, the negro considers himself better than an Indian, but the Indian, at least he of northern Turanian parentage, is a gentleman, an aristocrat, fallen though his fortunes may be. The Norman Conquest, Imperial Rome, and even the eponyms of Israel's tribes, are modern to him who traces his ancestry to a time when the pyramids of Egypt were yet unbuilt. The Indian belongs to a senile race ; he has reached his second childhood.

IV.—*The Jamaica Maroons—How they came to Nova Scotia—How they left it.*

By D. BRYMNER, LL.D., Dominion Archivist.

(Read May, 23, 1894.)

The echoes of the terror caused by the Maroons in Jamaica still lingered when I was a boy, but they must long since have died away, as it is nearly a century since these negroes were removed to Nova Scotia and thence transferred to Sierra Leone.

For the early history of the Maroons I have relied chiefly on the account by Bryan Edwards and on that by Dallas. The one was published in 1796, in one volume, and is, in reality, an official answer by the legislature of Jamaica to charges made against the authorities in the island; the other, largely, if not wholly, a compilation from statements made to Dallas by Mr. Quarrell, the commissioner sent, during the final outbreak, to Cuba for dogs and slave-hunters, and subsequently in charge of the Maroons on their removal to Nova Scotia. It was published in 1803, in two volumes, much of it consisting of an eulogium of Mr. Quarrell, to whom is ascribed the chief honour of restoring peace to the island, but his statements on that and other subjects are not to be relied on entirely. For the history from 1796, I have consulted the original correspondence contained in the Public Record Office, London.

The origin of the name "Maroon" has been the subject of much controversy. Long, in 1774, calls them "hog hunters," from *Marano*, a young pig. The *Encyclopedie*, quoted by Edwards, derives it from *simaran*, an ape, from their hiding in the woods. Lucas, in his recent work, "A Historical Geography of the British Colonies," says it is an abbreviation of *cimaron*, derived from the Spanish or Portuguese *cima*, "a mountain top," and refers to the "Encyclopedia Britannica" for further information, but that work throws little light on the subject. These various derivations depend almost entirely on the statements of early adventurers, who are not greatly to be trusted in matters of philology. I am inclined to think, but I give the suggestion with reserve, that the name is a direct application of the word *marron*, "a wild or stray dog." Littré, in his great French dictionary, gives the name as *nègre marron*, "a fugitive slave who betakes himself to the woods," an explanation which might suit any of the derivations. The question is one of no great importance, but it may be noticed that the Malagasie slaves in Mauritius, imported by the Dutch, were known, when they fled to the woods, by the same name as those in Jamaica.

The island of Jamaica was taken possession of by Columbus for Spain in 1494, and was subsequently granted to his family, the vicissitudes of whose fortunes it would be out of place to deal with here. It was twice taken before its final capture during Cromwell's time; once by Shirley, in 1596, according to Dallas, or 1597, according to Lucas, whose accuracy I am more inclined to trust, for I did not think it necessary to search for the official authority; it was again taken by Jackson in 1635. These were, properly speaking buccaneering expeditions for the sake of plunder, at least they ended, if they did not begin, with that object in view; for they were certainly not regularly organized attacks for the acquisition of territory to form part of the national domain.

When the Spaniards took possession of the island, the native population is represented to have numbered about two millions, described as mild and inoffensive, possessed of many of the arts of civilized life and proficient in agriculture. After the death of the first governor, whose rule was mild and gentle, his successors, it is asserted and preserved in history, determined to clear the land of the ancient inhabitants, and apparently effected their object, as, according to Dallas, not a solitary individual of that race could be found when the island was taken possession of by Venables and Penn in 1655. At that date there were about 1,500 negro slaves in possession of the Spaniards, the great bulk of whom, with many of the dispossessed Spaniards, their former masters, took to the woods and mountain fastnesses, and thence carried on an irregular warfare, no country in the world giving greater facilities for attacks of this nature, being mountainous, wooded, and full of almost inaccessible retreats, with narrow, tortuous and rugged approaches, overlooked by steep wooded banks, from the shelter of which a few determined men could exterminate a well-appointed army without loss to themselves.

A question arises as to the positive truth of the charges against the Spaniards of their ruthless and blood-thirsty slaughter of the natives, when it is compared with the attachment shown by the slaves for their Spanish masters. It is well-known that native races, of hardier frames than those who inhabited Jamaica, have dwindled and become extinct in the face of civilization, even when no ill-treatment could be alleged against their conquerors. From causes of this nature, therefore, the race may have died out without any blood-thirsty or predetermined design on the part of the Spaniards. It is probably impossible now to solve this question. The real cause of the inveterate hostility of the Maroons to the new owners of the island has not been so much as touched on. Some explanation of it may be found in the temper and disposition of the soldiery, who, from the first, were insubordinate and mutinous; not only disobeying their officers, but wantonly destroying the cattle, grain and property of the unfortunate inhabitants who had remained on their lands when the others fled to the woods, raising in them a spirit of hatred, and

driving them to join in the mountains those who had already taken shelter there. In the hands and under the control of a strong man like Cromwell, the troops employed in the reduction of Jamaica might have been kept in order, but a body of men strongly embued with levelling principles and impatient of the slightest control, especially refusing obedience to the royalist d'Oyley, could only have been kept in military subjection by the determined power of the leader of the Ironsides, whom he disciplined into a trustworthy force. Hence the violence and scenes of disorder in the island, and hence, there seems little doubt, the bloody reprisals made by the fugitive Spaniards and negroes, who burned and destroyed animate and inanimate alike, whenever they had or could make opportunity, slaughtering without mercy every man, woman and child of their hated conquerors, giving no quarter to any one, no matter of what age or sex.

A few trifling advantages over the Maroons were counterbalanced by the slaughter of soldiers and others caught straying out of bounds. Want of provisions and ammunition secured, in 1664, the surrender of part of the fugitives, but a large body held out and kept the interior of the country in such a state of alarm that few ventured far from the coast; the whites who attempted to form settlements inland being ruthlessly slaughtered.

A proclamation offering a free pardon, 20 acres of land, and freedom from slavery, had little, if any, effect, and Juan de Bolas, the head man of the party which surrendered, was killed when in command of an expedition for the reduction of those who held out. Under pretense of negotiating for peace, the hostile blacks obtained breathing time, and having lulled the white inhabitants into security, the slaughter began with greater intensity and the island was under a reign of terror for upwards of forty years, according to Edwards. Even counting from the renewal of the outbreak after 1664, this state of affairs lasted till 1738, a period of 74 years. In reality, the duration of the Maroon war, without cessation, was 82 years, for the peace of 1664 was only partial, and, so far as the part which held out was concerned, was only a truce, during which preparations were made for fresh hostilities.

Cudjoe, the leader with whom peace was made in 1738, was a man who from his physical and mental qualifications obtained the chief command over the different groups of Maroons. For years he had, by the skilful disposition of his forces, defied every attack, taking advantage of the peculiar formation of the mountain recesses and the difficult approaches. But experience taught the white commanders how best to meet the tactics of the Maroons by means suited to the contest with an enemy who could fight and disappear with little loss, after causing great injury to the invading force. In 1730, two regiments of regulars were sent to the island as a reinforcement, corps of rangers, light auxiliary

troops were employed, and the whole of the militia called out, so serious had become the danger to the island from this guerilla warfare. The Maroons, active, hardy and brave, and knowing every pass and the most suitable places for lying in wait, made the task of reducing them one of great difficulty and danger. To the white forces were added loyal negroes, known as "black shot," mulattoes and Indians, the latter brought from the Mosquito shore. Attacks were made constantly on the provision grounds of the Maroons, and a harassing war was carried on against them, but at great loss of life to the attacking parties. To avoid long marches and facilitate the attacks, posts were established in situations as near as possible to the Maroon settlements, and, when possible, in such positions as to prevent them from obtaining access to their provision grounds. These posts were garrisoned by white and black troops and baggage negroes. Their duty was to make excursions, scour the woods and mountains, and destroy the provision grounds and haunts of the Maroons. To assist in these duties, every barrack was furnished with a pack of dogs to track the enemy and prevent surprises at night. Both sides became tired of the conflict, and it was only a question of time which should first hold out the offer of peace to the other. The constant alarms, the hardships of military service, and the intolerable expense without any adequate results, urged the white inhabitants to secure peace on any terms. The famine to which the Maroons were exposed, hemmed in, as they were on all sides, with their provisions destroyed and access to water rendered almost impossible, drove the Maroons in the same direction, so that they were tempted to surrender unconditionally. Fortunately for them, their desperate state was not known, and the extreme step of an unconditional surrender became unnecessary by Governor Trelawney proposing overtures of peace. On the 1st of March, 1738, as the result of negotiations, a treaty of peace was concluded between the Governor and Cudjoe, acting for the Maroons, by which it was stipulated that to one body of them should be assigned in perpetuity 1,500 and to another 1,000 acres. The second clause of the treaty provided for their perpetual freedom; the sixth that Cudjoe, his adherents and successors were to assist in hunting down all rebels on the island; the seventh that they were to assist in repelling invasion. Other clauses provided for the redress of grievances and injuries committed on or by Maroons; they were to apprehend fugitive slaves, for whom a reward of thirty shillings each was to be paid, afterwards increased to three pounds. Laws and regulations were from time to time passed for the government of the Maroons. As the ostensible cause of the last conflict that preceded their deportation to Nova Scotia was the violation of the treaty by the flogging of two of the Maroons, it may be as well to examine its terms. By the eighth clause it was agreed that in the event of injury being done to any of the Maroons, application should be made to the commanding

officer or a magistrate in the neighbourhood; should the injury be committed by a Maroon on a white person, he was to be given up to justice. No mention is made in the treaty of the penalty, which it is plain from all the circumstances was to be the usual punishment for the particular offence, whether that had been committed by a Maroon or by a white. For crimes committed among themselves the punishment, short of death, was to be decided by the captains. So extreme an offence as subjected the criminal to such an expiation was to be in the same manner as was done in similar cases among other free negroes.

Cudjoe's treaty did not, however, restore peace at once. A party under Quaco, known as the Windward body, still held out, and inflicted a signal defeat on the troops sent after them, so complete, indeed, that the troops were glad to escape, leaving the dead and wounded on the field. It was more than a year before a complete pacification was effected, the treaty with Quaco being signed in the summer of 1739.

Peace once established, the regulations so solemnly passed by the Legislature of Jamaica appear to have become a dead letter. The character and habits of the Maroons are so differently described by the two authors, Edwards and Dallas, as to be altogether irreconcilable. The descriptions by Edwards appear, on the whole, to be nearest the truth; Dallas, whilst attempting to explain them away, unconsciously admitting their correctness. The accounts of the occurrences in the slave revolt of 1760, furnish a good example of this diversity of opinion. In pursuance of the treaties, the Maroons were to take part in the attack on the revolted slaves. Edwards states that they set out on the expedition and returned with the ears of the rebels, whom they represented they had slain, so that they might get the stipulated reward, but that it was discovered afterwards they had simply cut the ears off corpses and had been of no service. A few nights after this occurrence, he continues, the troops were attacked by a concealed enemy and a number of the soldiers killed, but not a Maroon was to be seen, so that it was at first supposed they were the assailants, but after the fight they were found lying down in concealment. "The picture," says Edwards, "which I have drawn of "character and manners, was delineated from the life, after long experi-"ence and observation." Dallas, on the other hand, speaking from hearsay, says they were active in the suppression of rebellion, and stood forth with determined spirit against the insurgents, and in 1760, the same year spoken of by Edwards, they lost several of their people. Their long contest, even under every advantage of concealment, proves they were not cowards; but Dallas, agreeing with Edwards, states the fact of their marital, or *quasi* marital, connection with the plantation slaves, which may fully account for the inaction described by Edwards.

For some years after the treaties of 1738 and 1739, they led a wandering, idle life, any cultivation that was done on their farms being the

work of their wives, of whom each man could have as many as he chose, the number varying from two to half-a-dozen, sometimes more. The men were idle, not lazy, a distinction well brought out by Washington Irving in his "Rip Van Winkle," whom he describes as doing no useful work, but wandering for days in pursuit of game, carrying a heavy fowling-piece, a burden greater than would have been required in the discharge of his proper duties; and this was the case with the Maroons. The regulations for their control, and by which their wanderings could have been restrained within due limits, were not enforced. They kept up a constant intercourse with the plantation slaves, forming temporary marriages with them, for the marriage tie sat lightly on them, the children of these marriages becoming slaves, following the condition of the mother. Proud of their freedom, regarding the slaves as inferior, no discipline enforced, they went about at their own sweet will, an idle, vagabond community, and when an attempt was made to control them the inevitable result followed, the long indulgence had done its work and no restraint was possible. Examples of this are easily to be found in families and in communities who regard themselves as on a much higher plane of intellect and civilization than the free blacks of Jamaica.

From the signing of the last treaty more than half a century (fifty-six years) had passed without an outbreak by the Maroons. Cudjoe and his generation had passed away; another generation had followed. Of all the Maroons who were alive in 1795, when the final struggle began, it is probable that not one had done an honest day's work, labour of all kinds being left to the women. It is possible that a few may have been industrious, but it is extremely improbable. Their position was peculiar; they did nothing; they amused themselves; they strutted about, black Apollos, uncontrolled; they looked down with ineffable contempt on the negro slaves, who were compelled to work and were subject to being flogged at the caprice of a slave driver; the slaves in turn looked up to them as superior beings. Under these circumstances it needed but a slight cause to bring about a fresh conflict between them and the power which had abnegated its functions and let authority slip out of its grasp. The pretext was found in the case of two worthless vagabonds, despised by the Maroons themselves, who, charged with felony, were tried, found guilty and flogged, as a white man would have been under similar circumstances. The punishment was not in itself objected to, but the executioner of it was, a recaptured negro slave kept in prison to flog the slaves brought there for punishment. Maddened by resentment at what they considered an insult, and still further incensed by the jeers of the slaves, who taunted them with having been subjected to the same treatment as themselves, the younger men, contrary to the advice of their seniors, sent a defiance to government and prepared for a struggle. Probably, however, owing to the counsels of the more cool-headed among

them, they proposed a conference, alleging that they were desirous of coming to terms. The object was, there can be no doubt, to gain time until the troops had left the island, orders having been given to that effect. The Governor, deceived by their assurances, allowed the troops to embark and sail, but on receiving authentic intelligence that the Maroons were determined to rise, he was fortunately enabled to recall at least a portion of the troops before hostilities began. The first defiance was given early in July, 1795, the first actual outbreak nearly a month later, when the Maroons burned their own town, attacked the outposts and took to the mountains. Before the end of January, 1796, the war was practically over, the great body of the Maroons had signified their desire to surrender on conditions, one of these being that if they fulfilled the agreement to come in at once and lay down their arms, they should not be removed from the island; the third that they were to send back all fugitive slaves who had taken refuge among them. The non-fulfilment of this latter also left the determination of their destination an open question. Neither of these conditions was complied with and the Governor and Legislature determined to send them off. The agreement not to send them away was accepted by General Walpole on his word of honour, and when the resolution was taken to expel the Maroons from Jamaica, he felt keenly what he considered to be a breach of his agreement and refused to accept the sword of honour voted for him by the Assembly. This feeling was, no doubt, highly creditable to General Walpole's high sense of honour, but the circumstances appear to indicate that it was due to an over-strained estimate of the obligation he had incurred towards the Maroons. That they did not come in and lay down their arms is undoubted, and that a second expedition to force them to come in is fully proved. That the other condition was also violated, by the non-delivery of the fugitive slaves, is not open to doubt. Add to this the necessity of getting rid once for all of a most dangerous element to the community and the removal was not only justifiable but necessary. Not on the latter ground had that stood by itself, and that the terms of the treaty had been carried out, for in that case the agreement, however imprudent, could not have been disregarded, except at the cost of public dishonour.

The final surrender was accomplished by means of the second expedition, and the part played by the Cuban bloodhounds in securing this result has been made the most of. According to the account of General Walpole, the highest evidence on the subject, the dogs had nothing to do with the surrender, which he attributed entirely to his method of dealing with the Maroons by gentle means. Speaking of his success in bringing about a surrender, General Walpole, writing on 23rd January, 1796, says: "The dogs had certainly nothing to do with it; it was not, I apprehend, "known to the Maroons that they were with us, for the Maroons had "moved the day before we did."

The Maroons, after their complete surrender, were transferred to barracks, strongly guarded, and preparations were made for their shipment, it being the intention to settle them in Lower Canada on lands acquired for that purpose. Upper Canada had also been suggested as a suitable place, but finally the decision was arrived at that they were to be taken to Halifax, there to remain until instructions were received from the Secretary of State, and Messrs. Quarrell and Ochterlony, the commissaries who were to accompany the banished Maroons, were directed accordingly. On the 26th of June, 1796, the transports having them on board sailed from Port Royal harbour, in company with a large fleet bound for Europe under convoy, from which they parted on reaching the coast, and on the 24th July Governor Wentworth wrote to the Under Secretary of State that they had arrived at Halifax, but were not yet landed, and that he thought they would make excellent settlers. The date of arrival is not given in Governor Wentworth's letter; one of the vessels arrived on the 21st, and the rest on the 23rd of July, the passage having thus taken close upon seven weeks.

The first employment in which the Maroons were engaged after landing at Halifax was on the fortifications erected on the demand of the Duke of Kent, then general in command of the district, an attack being apprehended from the squadron under command of Admiral Richery, in prosecution of the war by revolutionary France then in progress. The Maroons were housed in temporary huts, rented houses and tents close to the place of their employment; and they worked cheerfully under the direction of the Duke, offering, indeed, to work for the King's son without pay, an offer which, of course, was not accepted. Their conduct gave general satisfaction, relieving the people of Halifax of the apprehension that had prevailed from the accounts they had received of the ferocious and bloodthirsty character of the new arrivals. The weather, too, was favourable to the diffusion of a spirit of satisfaction among the Maroons, as they arrived in the warm season, the heat of which approached, if it did not equal, that of the island which had been their home. By the end of October they were settled on the lands purchased for them, not without internal disputes, and their want of experience in defending themselves against the cold must have caused great discomfort, although the correspondence does not show this, Wentworth writing in November that they were enjoying comfort and happiness.

From the first the Governor did not place much confidence in the commissaries, but assumed the whole care and management, alleging that the commissaries were strangers to this business, and, as far as can be judged from the correspondence, there was a mutual dislike. The winter passed over quietly, but in the spring, after the experience of the cold season, a spirit of restlessness seemed to prevail among the Maroons. Whether this prompted the proposal of Ochterlony, one of the Jamaica

commissaries, or whether he first suggested the movement, is not clear, but in the month of April, 1797, Ochterlony presented to Wentworth his scheme for embodying the Maroons as a regiment, himself to be colonel, to be transferred to the Cape of Good Hope. The plan was not regarded in a favourable light by Wentworth, who represented to the Secretary of State that the regiment would be encumbered with a train of women and children double the number of the men, and to turn such a body of men loose at the Cape with arms in their hands would be dangerous to the community. The safest place for them, he maintained, was Nova Scotia, where they could do no mischief nor mix with people who could corrupt them. He charged Ochterlony with being actuated by interested motives, hoping to make a fortune as colonel. The scheme was defeated, and Octherlony was dismissed from his office, on the charge of causing serious losses to Jamaica by his mismanagement. The Maroons were then placed in charge of Capt. Howe, under whom they are reported to have made satisfactory progress, but that they made any real progress is exceedingly doubtful, for although a favourable report is made of the children at school, the men, it is complained, would do no work, hoping to be kept in idleness, a fact not to be wondered at, considering that whilst in Jamaica they did absolutely nothing but amuse themselves.

The number who left Jamaica and landed at Halifax is nowhere clearly stated. "About" 600 are said to have been on board the transports on leaving Port Royal, but this can have been only an approximate estimate. The first enumeration reported is that made by the surgeon, Oxley, on 1st July, 1797, who gives the total as 526, increased 1st August to 532, and on 1st September to 543, both increases being due to births. But that these must have been more numerous seems evident, as one death is noted and there were probably more, so that there must have been births to counterbalance the losses by death.

Early in 1799 Wentworth complained of intrigues to foment discontent among the Maroons, who but for these would have been happy and contented, yet in the same despatch he reports that they are determined to get back to Jamaica—two statements which it is not easy to reconcile.

In 1796, before the Maroons had been sent to Nova Scotia, a correspondence had been opened by the Secretary of State with the African Company on a proposal to send them to Sierra Leone. But the experience of the company with the negroes who had fled from the United States during the war ending in 1783 and taken refuge in Nova Scotia, from which they were removed in 1792, led the directors to refuse to entertain the idea of dealing with another body of negroes whose reputation could not be held to warrant such a step. The conduct of the first body of negroes had been turbulent and mutinous, causing great anxiety and expense to the company, and not unnaturally the directors dreaded that the Maroons would make common cause with their brethren in

colour. This is not the opinion that was held at the time, as it was then supposed that the African Company had been exerting influence to secure the removal of the Maroons from Nova Scotia to Sierra Leone. An examination of the correspondence shows that this belief was ill-founded. Early in 1799 the Secretary of State reopened negotiations with the African Company, which did not respond with warmth; in fact, showed a great unwillingness to undertake the charge of these people. In May Wentworth wrote that he had heard of the negotiations, but his letter of the 23rd was very cautious. On the 24th, the following day, he gave the proposal for the removal of his approval, and added, showing the changed feeling towards them after nearly three years' residence in the province, that the inhabitants had great satisfaction at their being taken away. Difficulties, however, continued to be raised by the African Company to their reception, owing to the danger apprehended from their being settled on the mainland, and the necessity of placing them on an island from which an exit would not be easy. Finally they recommended the acquisition of the island of Bulam, at a sufficient distance from Freetown, which would not only accommodate them but the Caribs—an incidental evidence of the intention to remove that body of people also from the West Indies, where they had played the same part in St. Vincent as the Maroons had done in Jamaica. Obstacles to their speedy shipment arose, too, in Nova Scotia, where transports could not be obtained, although in February, 1800, they were ready to embark at an hour's notice. When this was overcome, the agent for the African Company protested against their sailing before August, as otherwise they would arrive in the rainy season. On the 6th of August Wentworth reported that they had embarked and were ready to sail, but before leaving they made an offer to contract for the delivery of 500 slaves, presumably to be caught after their arrival at Freetown—not a good augury of their future behaviour. They arrived in Sierra Leone on the 1st of October, 1800, assisted to quell an insurrection among the negroes previously sent from Nova Scotia, three of whom were executed, several banished, and some of the ringleaders escaped among the natives. The conduct of the Maroons in Africa was on the whole satisfactory, but they still retained a longing to return to Jamaica, so that little cultivation was done, nor is it likely much would have been done in any case, although they are reported to have become good mechanics and labourers. What became of them subsequently it is beyond the scope of this paper to trace.

V.—*A Plan for a General History of the Province of New Brunswick.*

[Contributions to the History of New Brunswick, No. 1].

BY WILLIAM F. GANONG.

(Presented by Dr. George Stewart, F.R.G.S.)

INTRODUCTION.

For several years it has been my intention to write a general history of the province of New Brunswick. To this end I have worked assiduously in studying original records, in collecting materials and in analysing and correlating causes and effects in the evolution of local events. I was led to my intention by several considerations; first, the want of a work of any kind upon the subject; second, everything which concerns New Brunswick interests me; third, I wished to make to this, my native province, some return for the personal service which I owe to her, but which I have had to withhold. But lately I have wavered somewhat, and this, not because of loss of interest, nor through pressure of other occupations, nor yet through fear of the proportions of a task colossal enough to appal one who can give to it only a scanty leisure, but because I have come to distrust my own powers of accomplishment in this field. Every man tends to write that kind of book which he likes best to read. A history of mine would be coldly scientific, precise, classified, complete; but it would lack the life and form and colour which should distinguish a history for the people. It is only when he writes for brother students that the modern historian may argue, anatomize and be statistical; when he addresses a general audience he should be first of all an impressionist. I have discovered that in history my tastes are rather those of a pre-Raphaelite, and therefore I relinquish my twelve-year growing desire to try to write a history worthy of my native province.

In the course of my studies I have gathered not a little new and valuable material. To preserve this, I propose to offer it to this society in a series of papers now in preparation. In preface to these, I beg to submit herewith a sketch of the plan I had finally fixed upon for the history. Developed naturally in the study of the subject, the plan has a value, in that it represents an adaptation to the conditions of the case, and therefore shows very nearly the treatment which must be adopted by any good history of the province.

1. Upon the Characteristics of a Good Local History.

In the preparation of a local, or indeed any, history there are two main factors; first, its character, that is, its objects, ideals, and spirit, and, secondly, the events which are its theme. The principles of the former will be the same for all local histories; the latter must vary with the locality.

For the existence of local histories there are many reasons, of which by far the most important is, to enable us to know objectively our social and political environment, and present conditions can be thoroughly understood only when viewed in light of their origin; second, they provide to writers and to readers an intellectual occupation, the healthiest and purest of pleasures, radiant of good influence; third, men having been psychologically alike since the beginning of historic time have caused history to repeat itself, and if we would but mark and heed the rhythm of events, they would form a useful guide to the present, and even a key to the future; fourth, they nurse patriotism; fifth, we have a natural interest in the doings of our fathers; sixth, history takes hold on our imagination and pleasurably appeals to the romantic and the poetic in us, for truth is always stranger than fiction, which is but its satellite, and glimpses through the mists which surround the past, charm us in contrast with the glare of the ever commonplace present.

The qualities which a local history should possess in order best to cultivate these uses are in ideal the following:

It should be accurate and complete. The details of the story must harmonize with the truth and be approved by the stern eye of science. The writer must go direct to every original source of information, must weigh, sift, judge, and distinguish clearly what is certain from what is probable and that from what is possible. The highest attributes of scientific investigation are required here.

It should be impartial, that is to say, objective. A good local history cannot be written by one too deeply concerned in it; it must be the work of a man of travel and culture, of cosmopolitan sympathies, a psychologist who can analyse the motives of men, one who can write not only from a distance but also from a height. He alone can view his field in proper perspective. Impartial, scientific, psychological history is very modern, but its day is dawning and it is even already with us. The older kind worshipped that "idol" of our minds which makes us the chosen people, all in the right, the martyrs or the justly triumphant, and our enemies all bad, all in the wrong, the persecutors, the Gentiles. The new history recognizes that men and nations average much alike, and under the same conditions act much alike; that the relations of victor and vanquished, oppressor and oppressed, loyal refugee and persecuting colonist are matter less of inherent right and wrong, than of

success and failure. To love your enemy as yourself is enjoined to the modern historian.

It should be causative, comparative, symmetrical. The threads of cause and effect should be disentangled and made straight, for in these lie the chief lessons of history. Then, by constant comparison, the progress of local events should be kept in touch with what goes on in the world outside, whether there be organic connection between the two, or whether they be simply parallel or merely synchronous. Local history cannot be clearly understood unless it teaches its own relation to the progress of mankind. And this requires also well-proportioned treatment, all topics receiving, as they do on a good topographical map of whatever scale, emphasis in the exact ratios of their importance.

It should be readable, attractive as a story. For this it should be the work of a master of style, who is at the same time an impressionist in the best sense, one who with bold strokes and strong colouring can make his theme to flash as a living picture before the mental vision of his readers, recalling surroundings as they were, causes as they acted, results as they followed, heroes as they achieved or failed, people as they lived and worked and fought and died. To make the past as vivid as the remembered events of yesterday is the ideal of the picturesque side of the historian's art.

It should have local colour. Especially in local history where great events with their lessons are wanting and interest is chiefly personal, the locative or exact-spot idea should be kept prominent. Local peculiarities of customs, traditions, prejudices, superstitions should be recognized. The writer should feel the environment and reflect it, should himself know and love the hills or rivers or plains which give character to the country and its people. In a word the true atmosphere of the locality should be breathed around local affairs.

It should be primarily topical and secondarily chronological. It should be arranged according to periods, each receiving complete treatment and showing its influence upon subsequent ones and even upon the present. Of these periods certain ones are common to most histories, others are peculiar to the special locality. First of all must be treated the physical environment, which powerfully affects the course of history of a country, both by controlling settlement and industries and by moulding the character of the people. The geography, physiography, meteorology, plants and animals have far more influence upon making a people what they are than is generally recognized; second, there are the native tribes, and their character, and their relations to the new-comers; third, there are always the early explorers who were not settlers; fourth, there are the early settlers followed by, fifth, successive waves of population down to the present, the nature of these varying with the locality; sixth, in some form there always comes the struggle for home government.

Finally, it is the resultant of all the past conditions of environment and experiences, together with the fundamental characteristics of the races from which the people have sprung (these characteristics themselves the resultant of still earlier surroundings) which have made any people what they are to-day, and the clear delimitation of these influences is in reality the aim and end of the history.

It should have the narrative and the critical matter separated. Each period should have first its narrative part, unburdened by references and arguments, and forming a complete story in itself, with its introduction showing its relation to what has gone before and to contemporaneous events of the world, and its conclusion showing its influence upon the present. This is for the general reader. For the student this should be followed by critical notes after the manner of Winsor's "America" or Bourinot's "Cape Breton," but answering page to page with the text of the narrative, giving all needful references to authorities and sources of information, bibliographical and biographical and other special notes, with notice of questions requiring investigation. The importance of full bibliography is very great. It is a marked characteristic of the modern historian that he goes directly and sends his students to the original sources of information, just as the modern naturalist goes directly to nature. Finally, there should be a series of appendices to contain the more statistical matter, book-lists, map-lists, lists of place-names and lists and tables generally.

It should be tasteful in its make-up. The best art of the book-maker is not too good for a work which is to appeal to our highest faculties. Its illustrations should be reproductions of old views, maps, portraits, etc., and in no case manufactured pictures.

These I take to be the chief characteristics of the ideal local history. Of course, no single man can ever write such a work, but it is well to have ideals and to strive for them. I do not think the co-operation of several writers succeeds perfectly, for the result is always uneven. Of course it would not pay, and if very local, must be a gift to the public; but thus to give is the blessed lot of most pure scholarship, a not unhappy one, for it is amply rewarded in the doing.

2. The Arrangement of Topics in a History of the Province of New Brunswick.

Following is an outline of the plan above referred to for the history of New Brunswick, a plan which, be it remembered, is not merely personal, but represents an adaptation—mainly an objective, much less a subjective view of the subject.

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Sec. I. The Physiography and Natural History of New Brunswick.
Sec. II. The Indian Tribes.
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Sec. IV. The Period of French Occupation. 1604—1760.
Vol. III. Sec. V. The New Englanders and the English. 1760—1783.
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VOLUME I. GENERAL INTRODUCTION. A BIRDSEYE VIEW OF THE ENTIRE SUBJECT, SHOWING THE LOGIC OF THE DIVISION INTO PERIODS.

The interest in New Brunswick history must as yet be strictly local. It has played no part in the world's history, and but a very slight part in that of Canada. It has produced no very great men, none who have materially influenced the world's progress, either as reformer, statesman, inventor, author or scholar. No great decisive battles, military or legislative, have been fought on its soil; no great question has been answered within its boundaries; the eyes of the world have never once been focussed there. Its people show no sharply differentiated characteristics of any kind, and nothing to make them of interest to others. They have developed no special provincial customs nor institutions, not even such trifles as sports, symbols, songs, nor anything that is their own alone. They are not especially enterprising nor cultured. We have no provincial hero, novel nor poem. Even the Loyalist movement, our great event, was not our own alone. The Indian tribes were inoffensive, and since they are living in our own day, no romance can cluster around them. The early explorers mostly passed the province by, and no event of its later history is striking or unique. With one or two exceptions it exhibits no remarkable features of scenery nor special scientific phenomena. It possesses hardly anything which is not better shown somewhere else. These negative characteristics would give no hold for an attempt, even to consummate genius, to make New Brunswick history of interest beyond its own borders. Yet within these limits that history is varied and attractive to an altogether unusual degree. Its topography and scenery even if not grand are of great variety and charm, and its natural productions are many and important. Its people, if not homogeneous, are

yet of good stock and show interesting racial features; if not eminnet in any single respect, they nevertheless average extremely well. They are democratic, moral, law-abiding, and solid, honest and clean as the splendid north country they live in. Contrasting political changes have given incident and movement to their past, and there is not wanting the pathos of struggle and suffering and exile, and the joy of triumph, prosperity and hope. There come into view in succession the roving Indian, the hurrying explorer seeking a passage to the west, the picturesque French fur-trader, the colonizing Englishman, the independent New Englander, the exiled Loyalist and the sturdy immigrant from Europe, these giving us a series of distinct periods each with incidents, charms and results of its own.

Section I.—The Physiography and Natural History of New Brunswick.

As this subject is the one I know the best, and most local historians the least, I shall outline it somewhat fully, giving to the subsequent topics much briefer treatment.

In its ideal it should contain the clean-cut statistical science of to-day combined with the simple appreciation of nature of White or Thoreau. It should everywhere keep prominent the idea of comparison. It should treat in order:

Chapter I.—Introduction, pointing out the effect of environment upon the history of a people, with illustrations drawn from other lands and times, and outlining the topics to be treated and the logic of their order.

Chapter II.—The place of New Brunswick in comparative geography; absolute and relative size; position on the earth's surface, relation to land and water surface of the globe and to great routes of travel. Illustrated by diagrams to show to the eye facts of relative size and position.

Chapter III.—General Geology and Topography of the Province. Present contour depends upon past geological history and is the aggregate or resultant of it, and every physical feature of the landscape is traceable to a geological origin. The formations from the Laurentian down should be traced, together with the effect of each upon New Brunswick as it is to-day, including the extremely important glacial period so far reaching in its relation to productions and settlement. Illustrated by maps showing the geography at the successive periods, the present watersheds and slopes, etc.

Chapter IV.—The particular Geology and Topography of the Province. Dividing it into sections, based upon the most natural divisions, as for instance into the greater slopes, the Restigouche, Bay Chaleur, Nepisiguit, North-east Corner, Miramichi, Northumberland Strait, Petitcodiac, Bay of Fundy, St. John, and Passamaquoddy, these should be

much more minutely described, with the causes of the courses of rivers, of shape of the coast line, of the hills and marshes, etc., and the tides—their causes and effects.

Chapter V.—The Scenery of New Brunswick viewed in the light of its physical causes as well as æsthetic results. There is one feature in which New Brunswick is singularly rich, and in which she undoubtedly surpasses every other country of equal size in the world, and that is the number and beauty and usefulness of her rivers: she is pre-eminently "The River Province." But in addition to these with their fertile intervales, there are other types of scenery as well, high hills in the interior and bold cliffs at Grand Manan and along the Fundy coast, salt marshes in Westmoreland and great moors in Miscou and Shippegan. New Brunswick scenery is of a rugged, honest, untamed sort, not subdued and humanized as it is in most of Europe, outside of the Alps.

Chapter VI.—Economic Geology and Mineralogy. A discussion without prejudice of the occurrence of mineral deposits and what geology teaches of their probable future, including the demonstration of the small value of certain areas much advertised in boom literature.

Chapter VII.—Meteorology. Study of climate, absolute and comparative; effects of position, ocean currents, fogs, prevailing winds, etc.: local differences and peculiarities; snowfall; general character of summer and winter; effects of climatic conditions upon people; possibilities in agriculture.

Chapter VIII.—Botany. Relation of plants to soil and climate; groups represented in the province; number of species; their character and special biological features; occurrence of colonies from the North and South; their distribution and its relation to past climatic conditions; marine plants. Thanks to the labours of the Natural History Society of New Brunswick, exact data for these studies are being rapidly accumulated. Æsthetic aspects; charm of the northern flora. Economics: the lumber trade.

Chapter IX.—Zoology. Relation of animal life to climate and plant life; groups represented in the province; number of species, distribution, colonies, etc., as above for plants. Economic zoology; influence of fur-bearing animals and of food-fishes upon history and prosperity of the province.

Chapter X.—Summary Chapter on the Progress of the Seasons in the province. The awakening of plant and animal life and their course and relations through the seasons. Æsthetic side of the march of nature; the supreme beauty of the New Brunswick seasons; their variety; charm of bird notes and flowers; summer days and winter storms. The models of this subject are White and Jefferies in England, Thoreau in New England, and, better than all, Hudson in La Plata and Patagonia.

This chapter will fail of its end if it does not recall, or even suggest to a stranger, the true atmosphere of the province.

Chapter XI.—New Brunswick as a land for healthy sport; of free people; for colonists. Effect of topography, climate and natural productions upon character of a people; splendid inheritance of the young New Brunswicker; small appreciation by her own people, who sell its privileges to the highest bidders, but great appreciation by strangers; good books by Gordon, Dashwood, Sage and others, but no native literature.

Chapter XII —Place and topographical nomenclature, varied, appropriate and interesting.

Chapter XIII.—Effect of the preceding upon the exploration and settlement of New Brunswick, and the making of the New Brunswick people; the distribution of population; sites of towns; what is taught by the preceding as to the future of the province. Mining likely not to be important; all conditions favourable for agriculture and dairy industry, superiority of the lot of the New Brunswick farmer over that of the Western or European; abundance of land useless for agriculture but good for trees, and the omnipresent streams and rivers make the province particularly well adapted to timber-culture; abundance of water-falls and the strong tides promise unlimited cheap power for manufacturing when electrical conduction of power is perfected. Advantages of diverse resources in building up a strong people.

Critical notes to Section I.—Running commentaries on the above page by page, discussing sources of information, value of authorities, notes on development of knowledge in each branch. Biographical and bibliographical notes. References to where special topics are more fully treated, or lists of animals and plants are found, etc.

Appendix 1.—Bibliography of New Brunswick. A list of all works, papers, manuscripts, etc., relating to New Brunswick in general and to the above topics, in proper bibliographical form, with cross references to the preceding critical notes where value of each work is discussed; preceded by an essay upon bibliography, pointing out the value of consulting original authorities; æsthetic side of knowledge of old books; practical value of preserving old works; pleasures of a collector, etc.

Appendices 2, 3, etc., containing tables, statistics, etc.

Illustrations: Geological maps, diagrams, views of scenery, etc.

Section II.—The Indian Tribes of New Brunswick.

Most works on local history give a chapter to the Indian tribes, but this is generally compiled from various books and repeats old errors. This is particularly the case with books on New Brunswick and I have never seen in one of them anything on the subject which was not worthless. Our writers viewing them from a distance and judging them by their own standards, or finding that they fall below the ideals inspired

by Cooper, and forgetting that like the white man's their training only runs into lines useful to themselves, find them not worth the study, and dismiss them as ignorant and degraded, or else as an inferior order of beings. No scientific student of ethnology has yet given attention to our Indians, and only when such an one gives us the data shall we be able to judge correctly of where they really stand in the scale of humanity.

Chapter I.—Introduction: Effect of wild tribes upon settlement in general. Logic of division of the subject.

Chapter II.—The two tribes, Micmacs and Maliseets, in New Brunswick; description of them, and comparison with other Indians of North America, and other savage races; their character as traced in both habits and language

Chapter III.—Their ethnological affinities. Whence came they? How are they related to neighbouring tribes?

Chapter IV.—Pre-historic works and mode of life; their ancient village sites; routes of travel; divisions between hunting grounds of the tribes:

Chapter V.—Their condition when first found by Europeans; their customs; accounts of them given by Lescarbot, Champlain, Denys, LeClerc, etc.

Chapter VI.—Their language; primitive and as modified by contact with French and English.

Chapter VII.—Their legends, primitive and as modified; their richness has perhaps been overestimated of late—the promise of Leland's work is not sustained by that of Rand; particularly interesting are those which explain peculiarities of animals and peculiar features of topography.

Chapter VIII.—Their history from their discovery down to the present; their present condition; admixture of white blood; religion; status in law; physique (the World's Fair statistics); relation to civilization; probable future.

Chapter IX.—Their effect upon New Brunswick history and upon her people; this has been slight, but yet appreciable.

Critical notes upon this section, after the method already detailed.

Appendix 1—Bibliography of the Indian period.

Appendix 2.—Place nomenclature of the Indians, prefaced by an essay on the study of place nomenclature and its general principles. A study of the origin and meaning of all place names of Indian origin, both past and present, arranged in dictionary form.

Appendices 3, 4, etc.—Statistics. Censuses of the Indians, etc. Tables of Indian words adopted by French and English, and of English and French words adopted by the Indians, etc.

Illustrations, maps, photographs of Indians, pictures of objects of their workmanship, etc., etc.

Section III.—The Early Explorers: Norse, English, Portuguese, Spanish and French, 1000-1604.

An impartial discussion of the possibility of visits of the Norsemen to our shores. No student has yet claimed that they landed in New Brunswick, but one distinguished student of our early history, the Rt. Rev. Bishop Howley, of West Newfoundland, is working upon the route of the founders of Vinland with a result which makes them land in the province, and his view seems to me to have more in its favour than have those which send them to Nova Scotia, Massachusetts or Rhode Island. Cabot was probably never in the Gulf of St. Lawrence. but certainly other early voyagers entered it and the Bay of Fundy; Cartier explored the North Shore; David Ingram possibly descended the St. John. In a complete history, every possibility should receive discussion and every important theory should be mentioned. Finally came Champlain, and from this time on, we are on more certain ground. Effects of this period upon the following ones. This section of course divided into chapters as in the preceding and having introduction, conclusion, etc.

The cartography of the period is of great interest, and the gradual differentiation of New Brunswick out of the obscurity of the early maps forms a fascinating study in evolution.

Critical notes, as in previous sections.

Appendix I.—Bibliography of the period.

Appendix II.—Place-nomenclature of the period.

Appendix III.—Cartography of the period, prefaced by an essay on the study of cartography: its principles, the personal equation in map-making, historical value, etc., followed by a classified list of maps arranged to show evolution. Each map should be described by giving its date, author, title, size, scale, range.

Section IV.—The Period of French Occupation, 1604–1760.

The most picturesque, and hence, in some ways, most interesting era of our history, though with little effect upon its later course. There were struggles with the English, who twice during the period possessed the province, and there was one attack by the Dutch. The attempts at settlement by seigneuries were almost entire failures, and the fur trade was the great attraction. The struggles of LaTour and Charnisay, and the expulsion of the Acadians, stand out sharply in this period. As to the latter event, it would be easier to discuss it calmly had "Evangeline" never been written; by some writers this poem has been so constantly quoted that to many people it has assumed the character of an historical document, almost an original authority. The last word has not been said on the expulsion, and the subject invites impartial investigation. But

time has brought his revenges, and the Acadian people to-day are heaping the coals of fire upon the heads of their ancient enemy, for they form a large and loyal part of the people of the province, and are a bulwark and not a menace to it. An important part of this section is the discussion of the subsequent history and present status of the Acadian people.

Critical notes.

Appendix 1.—Bibliography of the period.

Appendix 2.—Place-nomenclature of the period.

Appendix 3.—Cartography of the period.

Appendices 4 and 5.—List of seigneuries, etc., etc.

SECTION V.—THE NEW ENGLANDERS AND THE ENGLISH, 1760–1783.

The New Englanders at St. John and Maugerville; the Scotch on the Miramichi; the Pennsylvania Germans in Albert County; Admiral Owens's Colony at Campobello; the Yorkshire men in Westmoreland; the English along the St. John; movement back to Maine at close of the Revolution; their effect upon later history.

Critical notes.

Appendices on bibliography, place-nomenclature and cartography.

SECTION VI.—THE AMERICAN REVOLUTION AND THE COMING OF THE LOYALISTS. THE FOUNDING OF THE PROVINCE OF NEW BRUNSWICK.

The most important epoch in our history, and one difficult to treat impartially. The Loyalist movement, the true foundation of the province—the movement meant more to New Brunswick than to the other provinces—it is truly "The Loyalist Province"; state of the country on their arrival; character of the Loyalists; men as free of spirit as those who drove them forth, and with the advantage over them of recognizing authority; how they faced their conditions; a grand subject for the historian.

Critical notes and Appendices, the latter including lists of Loyalist families and where they settled.

SECTION VII.—THE PROGRESS OF THE PROVINCE OF NEW BRUNSWICK DOWN TO CONFEDERATION.

Peculiar condition of the Loyalists; their education and character. Problems to be solved by them; their progress in the development of education, religious bodies, settlement, laws, means of transportation, literature, newspapers and periodicals, political parties, manufacturing, agriculture and other industries; definition of boundaries, etc., and, in general, progress in civilization.

Critical notes and Appendices.

SECTION VIII.—CRITICAL STUDY OF THE CHARACTER OF THE NEW BRUNSWICK PEOPLE IN THE LIGHT OF THEIR ORIGIN, SURROUNDINGS AND HISTORY.

The most difficult, but if well done, most valuable part of the work.

Complete classified index to the entire work; complete map, modern and historical, of New Brunswick, in sections.

New Brunswick has not a complete local history of any kind, Hannay's excellent work ending before the coming of the Loyalists. Probably no other civilized country is so deficient in this respect, and probably in no other civilized country are the archives so inadequately cared for, or in certain lines so nearly wanting altogether. The government of New Brunswick not only has no collection of published works relating to it, but it has not even a collection of its own publications, outside of the journals of its sessions. It would be easier, so far as authorities are concerned, to write the history of the province in London or in Boston than in St. John or Fredericton. But this lack of any history, and total want of appreciation of its need, makes the inducement to write such an one as I have sketched just so much the greater.

VI.—*Later Prehistoric Man in British Columbia.*

By CHARLES HILL-TOUT.

(Communicated by Dr. G. M. Dawson, May 15, 1895.)

The following notes and observations on some ancient British Columbian middens and tumuli in the vicinity of the Lower Fraser are offered in the hope that they may be found to possess some ethnological value, and also with the desire to call forth a wider and more active interest in these vanishing and, for the most part, unrecorded vestiges of a distant past. The writer's explorations among these melancholy monuments have led him to believe that we possess in them valuable records of the prehistoric conditions of the aborigines of this section of the Pacific slope and of their antiquity in that region. The middens of Europe and of the Atlantic seaboard, and the mounds of the great central and eastern valleys, have long been classic ground to the archæologist, and much labour and attention have been profitably bestowed upon them; but the middens and tumuli of British Columbia are as yet but little known to him, and have not up to this time, I think, received any serious or systematic attention at his hands. Yet the tumuli herein described constitute a distinct type of their own, with many interesting and unique features about them; and the midden from which the relics figured in the accompanying plates, I., II., III., were taken exceeds in mass and area the largest middens of Denmark, and abounds in interesting ethnological data. This particular midden, for which the name "Great Fraser Midden" has been suggested by the writer, is upwards of 1,400 feet in length and 300 feet in breadth; and covers to an average depth of about 5, and to a maximum depth of over 15, feet an area exceeding 4½ acres in extent. It is composed of the remains of shells, mostly of the clam (*Tridacna*, sp.) and mussel (*Mytilus edulis?*), intermingled with ashes and other human refuse matter. It is situated on the right bank of the north arm of the Fraser a few miles up from its present mouth and opposite the alluvial islands called Sea and Lulu Islands. The existence of so extensive a midden, composed so largely of the remains of shell-fish that belong to salt water, at such an unusual distance from the nearest clam and mussel-bearing beds of to-day, was for a time a puzzle to me. I could perceive no satisfactory reason why these midden-makers should have chosen this particular site for their camping-ground instead of one five or six miles farther down the bank and nearer to the present source of supply of these much-coveted dainties of their larder. And upon discovery, a little later, of other middens still higher up the river by fifteen or six-

teen miles, the puzzle became proportionately greater. I found it difficult to believe that the enormous mass of shell-fish whose remains enter so largely into the composition of these great piles had been laboriously brought up against the stream in canoes or "packed" on the backs of the patient "klutchmans." It was too contrary to the genius of the people to suppose this. Making a brief survey of the district, a little later, the fact was disclosed that the mouth of the river was formerly some twenty miles higher up than it is at present, and that the salt waters of the Gulf of Georgia had in bygone days laved the base of the declivity on which the city of New Westminster now stands, and had passed on from thence and met the fresh water of the Fraser in the neighbourhood of the little wayside village of Port Hammond. And, further, that the large islands, now inhabited by ranchers, which bar in midstream the onrush of the annual freshets, must once have had no existence at all, and even after their formation had begun must have existed for a very considerable period as tidal flats, such as are seen to-day stretching beyond the whole delta for a distance of five or six miles. That these islands were once tidal flats is certain from the fact that the water from the wells dug on them by the ranchers is so brackish that the water of the Fraser is preferred to it. And, further, that when in this condition they afforded shelter to shell-fish similar to those whose remains are found in the middens near by, is clearly evidenced by the fact that beds of similar shells are frequently met with, *in situ*, as I have been credibly informed, when digging for water in the interior parts of the islands. But as this discovery seemed to point to a rather remote past for the formation of these middens, I was reluctant to admit the obvious inference, until I had ascertained that the enormous stumps of cedar and fir which I found projecting from the midden—several of which have a diameter of from six to eight feet, and indicate by their rings from five to seven centuries' growth—had their roots actually in the midden itself; and had obviously grown there since the midden had been formed. Ascertaining this by personal excavation, and realizing that nearly three-quarters of a millennium had passed away, for certain, since the middens had been abandoned, I could no longer resist the inference that they had been formed when the islands opposite and below them were tidal shell-bearing flats; and I have since found no reason for questioning that conclusion.

The question now naturally arises, When and for what reasons was this ancient camping-ground abandoned? Was it at a period shortly before the appearance upon them of those forest giants whose size and approximate age I have just mentioned, or was it at a much earlier date; and was it abandoned because the particular community dwelling there had been exterminated by their enemies, or was it because the clams and mussels gave out in consequence of a sudden or a gradual rise in the level of the neighbouring flats? In seeking an answer to these queries, the

cause of the abandonment of so ancient a camping-ground may possibly be found in this last reason. That is a gradual, or possibly a sudden, deposition of river detritus on these flats raised them above the reach of ordinary tides, and so brought about the extinction of the shell-fish at this point, and made it desirable for the natives to seek a camp lower down the river, where the molluscs were able, as now, to maintain an existence. This explanation has the advantage of simplicity, and seems plausible; but the former cause suggested is not unlikely the truer one. The abandonment, many centuries ago, of so many other middens elsewhere in the district along the neighbouring bays and inlets, where no such cause as this can be assigned—where clams and mussels still exist in great quantities, and have so existed from time immemorial, as the extensive midden-piles now testify—seems to call for a more comprehensive and less local explanation. And further evidence and a more thorough investigation than I have thus far been able to give them may confirm the conjecture, which certain other evidence would seem to support, that the intrusion of the Salishan emigrants into this district, and the inevitable extermination of many of the former inhabitants, is more likely the real cause of the desertion of this and the many other ancient camping-grounds of this region. Should this conjecture hereafter prove to be the truth, the results of Dr. Boas's study of the Cowitchin tongue will receive an interesting and independent confirmation. The discussion and settlement of this question, however, must needs be left till further evidence has been gathered.

In considering the time *when* the abandonment took place, the physical changes which have clearly taken place in the estuary since the shells which enter so largely into the composition of the middens were gathered from the tidal-flats that have since become tree-clad and cultivable islands, afford us some clue to work upon in the case of the midden under consideration. If we can arrive at an estimate of the age of the islands, we shall get some idea of the period of abandonment; for there is little doubt, I think, that these Fraser middens were wholly formed before those physical changes which transformed the shell-bearing flats into islands, took place. In seeking to form this estimate, we are assisted in some measure by the independent, extraneous evidence of the enormous tree-stumps now found in the midden; and although Professor Cyrus Thomas has shown, in his investigations among the mounds east of the Rockies, that no great reliance can be placed upon the evidence of the age of trees based upon the number of their rings, the size, condition and other characteristics of these stumps, all warrant one in saying that many of them are from 500 to 700 years old. The age of the islands, then, cannot be less than the age of the midden trees, though it may not be very considerably greater. Exactly how much older they are it seems impossible, from the evidence at hand at present, to say with any certainty. There is nothing in their formation, as far as I have been able to learn, for

which it is necessary to assign a greater length of time than 1,000 years. They are wholly alluvial, and only just above the level of the freshets and high tides, and were often, before they were dyked, during the annual freshets, extensively inundated. And although they are in their higher parts now thickly covered with timber, I have not been able to find or hear of a tree more than a few feet in diameter or of more than three or four centuries' growth at most. It might occur to some here that the best way to get at the age of the islands would be to ascertain the rate at which the deposits of the Fraser accumulate at this point; but a little experience of the ways of the Fraser would soon convince them that this would be no easy task. To begin with, there is no uniform rate of deposit; the amount of detritus brought down by the river depends altogether upon causes beyond our control or calculation; the quantity brought down sometimes in one year exceeding that of any other half dozen. Last year was an instance of the kind; and cases like last year happen every now and again at uncertain intervals. If amount of matter brought down by the water counted for anything, then islands as large or larger than those now existing might have been formed, if circumstances had been favourable, during last year's freshet. It will easily be seen from this statement how useless it is to go to the river for information. If, then, I am correct in estimating the period which has elapsed since the flats ceased to support shell-fish and took on the form of islands at a thousand years, something like this period has, in all probability, elapsed since this camping-ground was abandoned by its owners, if on account of the extinction of their chief food supply at this point; and possibly a very much longer period if from the other cause suggested, which much of the osteological evidence gathered from these middens seems to support, viz., the invasion of a hostile people. But placing the abandonment at the latest possible date consistent with the presence and condition of the stumps, say 500 years ago, when to this has been added the period covered by the formation of the midden mass, we still find ourselves in the possession, in this extensive pile of refuse, of a monument of the past second to none in the country in antiquity. That the accumulation of such a heap of human refuse as this midden presents, to make no mention of others almost as large, occupied a very considerable period of time there can be no doubt, I think. It possesses many features of the Danish *kjoekken-moeddinger*, which led such eminent investigators as Worsaae, Steenstrup and Lubbock to regard the period of formation of those well-known piles as extending, in the words of the learned author of the "Origin of the Aryans," over "many centuries at least, more probably several millenniums." I am not unjustified, therefore, in claiming a very considerable period of time for the accumulation of these similar and much larger heaps of British Columbia. Viewing it, therefore, from the most conservative standpoint, it may be reasonably conceded, I think,

that the first layers of this midden could hardly have been laid down much later than the beginning of our own era. That this particular midden-pile was slowly formed through the centuries, and was not the rapid accumulations of a large body of people, is more than probable from the fact that there are on its surface, at some distance from each other, four or five crowns or eminences—due, as I have personally ascertained, not to any local elevation of the subsoil, but wholly to an increase in the midden-mass itself—which, from what we know of the mode of more recent accumulations of the kind, we may reasonably infer were old family centres. From these features, as well as from many other minor ones, such as the scarcity of relics, in comparison with other camping-grounds where large communities are known to have once dwelt, it may fairly be concluded that this midden was the refuse-heap of a few families only; and when it is remembered what an enormous mass of stuff there is in it, we are bound, on any reasonable hypothesis, to allow a very considerable time for its accumulation. And from the fact that the midden is found to overlie with a sharp line of division the clean, coarse gravel of the Drift—which, as far as I have been able to discover, shows little or no trace of vegetable matter, whereas the soil in the immediate vicinity of the midden and all along this bank is rich, dark and loamy to a depth of from a few inches to over a foot — it is pretty certain there was a settlement on this bank before the appearance of post-glacial vegetation in that district. Then the midden-mass itself bears unmistakable testimony to its extreme age, nearly everything taken from it, except the stones, being in the last stage of decay; an instance of which is the condition of the shell remains. Generally speaking, the shells when taken out whole, which happens rarely, all crumble to pieces at the touch, even when they bear no marks of fire on them. And that the clam shell, at any rate, is exceedingly endurable is clear from the fact that trees of over half a millennium's growth are repeatedly found along Burrard Inlet growing over refuse-heaps and gripping with their roots whole clam shells, as perfect and firm as the day they were thrown out. I have shells in my possession that cannot be less than five centuries old, from the position in which they were found, but yet it would puzzle anybody to pick them out from a number of others of the same kind from which the fish were taken only a few years ago. There are numerous other signs besides this that speak of extreme age. It rarely happens that a skull is taken out whole; it generally falls to pieces in handling. Then again, not a particle of wood has been found in the midden so far, unless it be the rotting rootlets of the trees that penetrate the mass to a depth of several feet. Axe- and tomahawk-heads, which were undoubtedly once fastened into wooden hafts or handles, are quite common; but where they are found there is never any trace of their wooden hafts to be seen. These and sundry other unmistakable evidences all seem to the writer to speak clearly of the antiquity

of the accumulation. I am anxious not to exaggerate this antiquity, especially in the face of the conclusion arrived at by Prof. Cyrus Thomas after long and careful investigations in the mound and midden districts east of the Rockies.[1] I merely desire to state the facts of the case as they appear to those who have visited and examined this midden; and think it possible that further investigation will make it necessary to extend rather than to curtail the age here indicated.

In the accompanying Plates I., II., III. are figured a fair sample of the relics thus far taken from this midden. There is nothing particularly striking either in the utensils or weapons recovered from it. They are mostly simple in make and design, and such as are found among other primitive people elsewhere. No pottery of any kind has been found in these middens; indeed the ceramic art appears to have been wholly unknown to the aborigines of British Columbia. The mortars or bowls and pestles figured in the plates were not, as is often supposed, for corn-grinding purposes. They do not seem to have possessed such; no grain of any kind being known, as far as the writer has been able to discover, among the West Coast Indians north of the Columbia. Nor have the middens thus far supplied the smallest evidence of horticulture of any kind. Some of their tools and utensils, such as the pestle, or, more properly, stone-hammer, figured in plate II., and the instrument resembling a belaying-pin, figured in plate III., are beautifully made and polished. These are wrought from a kind of granite of a hard- and close-grained quality. Others again are rough and rude in their make. It appears to have been customary to fashion their bowls after the likeness of some animal. The fish-head pattern appears to have been the most common. That shown in plate II. is of an unusual type. It has a bird's head with a quadruped's body, the back being hollowed out in basin form. There was one taken from the old camping-grounds at Port Hammond which had a human face carved on one of its sides, the top of the head rising several inches above the edge or rim of the receptacle, of a type that in no way resembled or suggested the face of an Indian, and of a character wholly different from any the writer has seen elsewhere in British Columbia. Large numbers of barbed-bone spear-points are found. The stone adzes, axes, knives and chisels are generally of jade; and one or two have been found with edges as sharp and keen as if they were made of steel. Bone needles, with the eye sometimes in the centre, at other times in the end, are often found. A favourite weapon among these midden people seems to have been one formed from the young horn of the elk. These horns in their first growth are round and pointed, and at this stage are selected by the warriors for their poqamangans or skull-crackers. The horn was apparently inserted in a stick or otherwise secured to a haft. They are aptly termed skull-crackers, for

[1] *Vide* Twelfth Annual Report of Bureau of Ethnology, 1890-91.

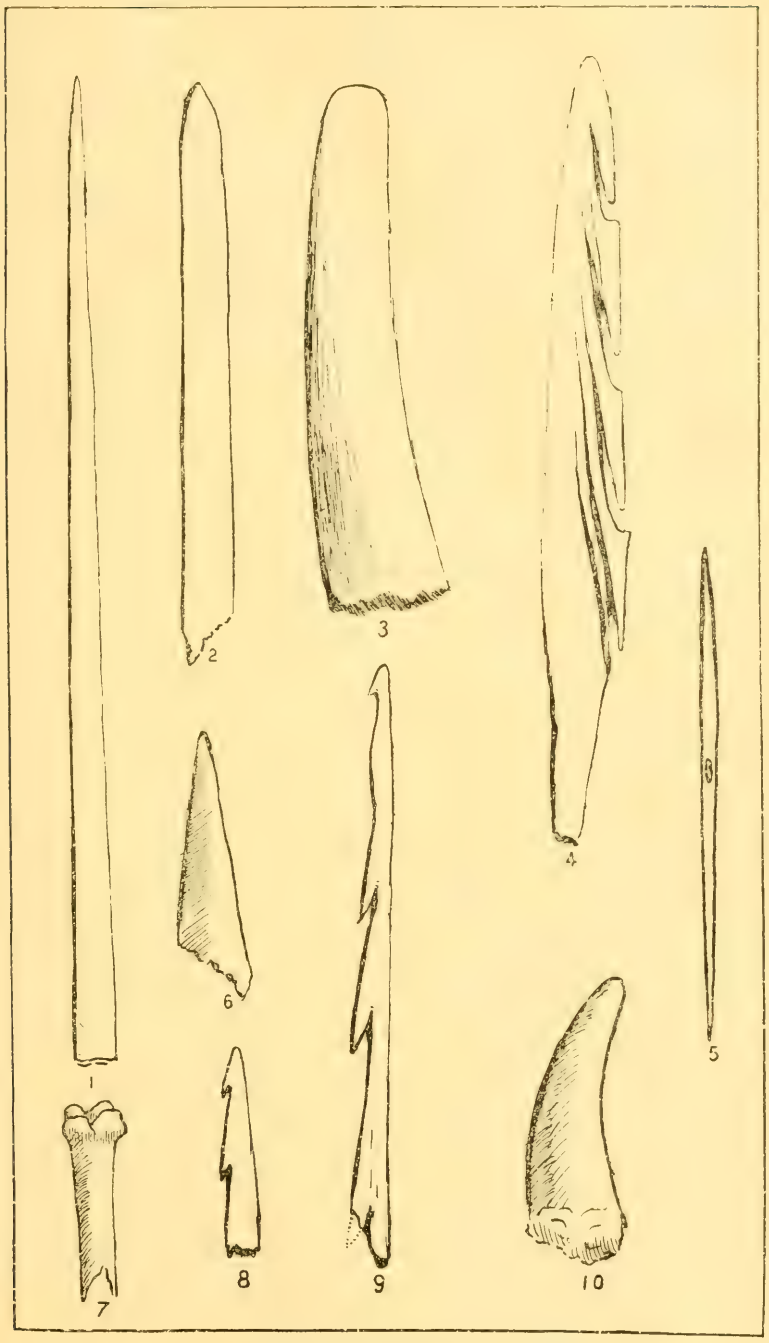

PLATE I.—BONE IMPLEMENTS FROM MIDDEN.

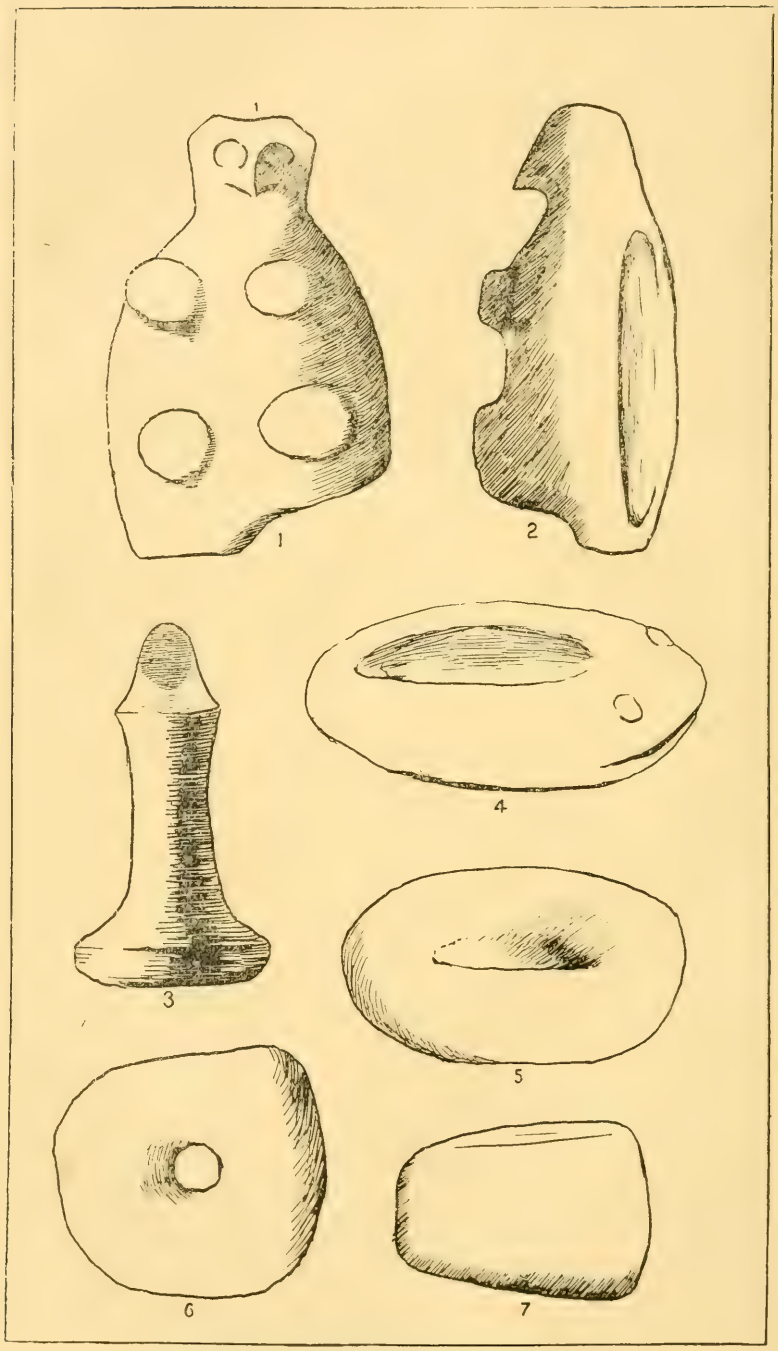

PLATE II.—STONE IMPLEMENTS FROM MIDDEN.

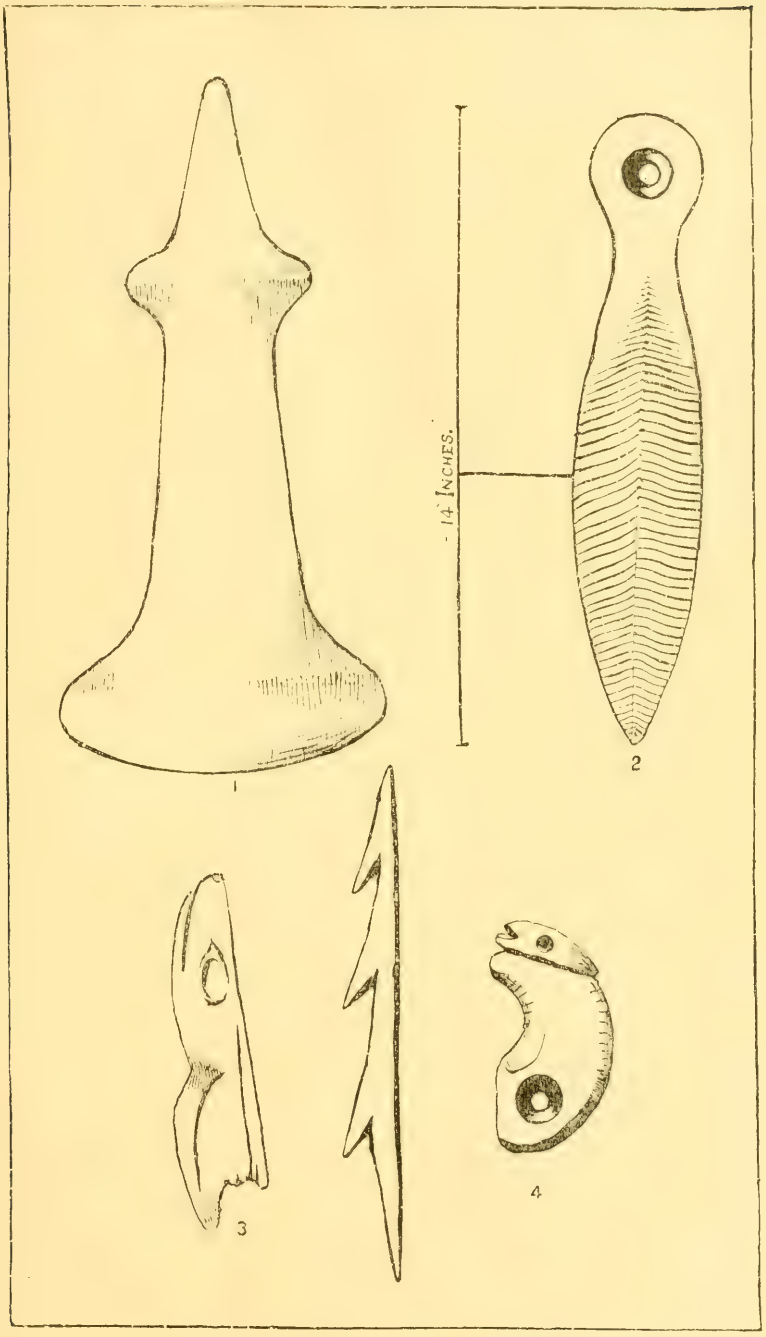

PLATE III.—BONE AND STONE IMPLEMENTS.

three adult skulls have already been taken from this midden with circular perforations in their crowns evidently made by these horn tomahawks, and as clean cut as if the piece had been taken out with a mechanic's punch. Another and significant point about the recovered crania of this midden is that they represent two distinct types: one decidedly brachycephalic, the other no less decidedly dolichocephalic. The former do not differ greatly from the crania of the Indians living round the estuary at the present time, and their presence in this midden may be due to intrusive burials; but the latter are wholly unlike the crania to be found among the Cowitchin tribes to-day; nor have I seen any so markedly dolichocephalic among the collected crania of the province accessible to me. They are too decidedly dolichocephalic to be classified among any of the typical groups of this region as given by Dr. Franz Boas, and suggest affinity rather with the Eskimo or eastern stocks, or with the southern dolichocephali than with any in this region north of California. The cephalic index of one in the possession of the Art and Scientific Association of New Westminster, B. C., is 73·85, and that of one in the writer's possession is practically the same, being 73·84; while the orbital indices of these two are 93·33 and 91·66 respectively. Both these crania are undeformed and normal and those of adults. A brief glance at the tables of the physical characteristics of the Indians of the Northwest Coast compiled by Dr. Franz Boas, and particularly those of the Lower Fraser River Indians will clearly show that these dolichocephali of the middens form a distinct type of their own and find no place among any of the eleven groups there distinguished by him.[1]

Other striking features of these midden crania which differentiate them further from the Lower Fraser group are the extreme narrowness of the forehead and the lofty sweep of the cranial vault. This is particularly seen in the height of the transverse arc, which as measured in the one in my possession, and which is not an extreme type, from one auditory foramen to the other across the sagittal suture is exactly thirteen inches, and the length of a line joining the glabella and the occipital foramen is 14·40 inches. These dolichocephalic crania are the osteological evidence I hinted at just now which seemed to support the hypothesis that the middens of this region were formed by a pre-Salishan people. Whether this is so or not, this much, at any rate, seems certain, that a people of marked dolichocephaly once lived somewhere in this region, for their crania have been found at one or two other points on the Fraser between Port Hammond and the estuary.

So far no copper or other metal instruments of any kind have been found in these middens; all the relics recovered being either of bone, horn, ivory or stone. Of these by far the most numerous are bone; very

[1] *Vide* Seventh Report on the Northwestern Tribes of Can. of the British Association, 1891.

few of stone are recovered. With the middens on the shores of Burrard Inlet the reverse is the case. Great numbers of stone instruments, particularly arrow- and spear-heads, have been picked up from the beach which have been washed from the old middens by the tides; the shore at several points here having sunk apparently some feet below its former level. In addition to the spear- and arrow-heads thus found, I have discovered at more than one point along these shores—which seem to be an old armoury of the midden people of that neighbourhood—several magazines or stores of designed but unfinished spear- and arrow-heads, all bearing the undoubted marks, in the method of their cleavage, of the skilled and experienced stone worker. A few well-directed blows from a skilful hand have divided larger masses of desirable stone into numbers of triangular and ovate pieces, easily transported and worked up into finished points at the arrow-maker's leisure. The stone commonly thus broken up was either a dark argillaceous boulder of crystalline character or boulders of dark gray basalt; and as I have been unable to find any of the former in whole blocks or boulders, on the shores of Burrard Inlet or elsewhere in the neighbourhood, the breaking had probably been done at some other point by others; from whom they were not unlikely bartered for dried clams, of which they had an inexhaustible supply here, and which, we know, were highly prized by inland-dwelling tribes. And as the arrow- and spear-heads I possess, taken from the Lytton burial heaps, are of the same material it is not unlikely that this is the direction from which these stones came, as also the jade tools—jade boulders being occasionally found in the Thompson.

It may now be interesting to pass from the middens and offer a few remarks on the tumuli or burial mounds of this region. As far as is known at present the mounds of British Columbia seem to be confined to the Cowitchin area. This may not be so in reality. It so happens that on account of that area being the most settled and accessible it has received the most attention from explorers; and this seeming restriction of area may thus be accounted for. As the country becomes more widely settled and opened up others will most probably be found in other parts of the province. In order to describe these mounds the better I shall divide them into two groups — the Mainland group and the Vancouver Island group. Those on the island were first discovered some twenty years ago; and the late Mr. James Richardson, of the Dominion Geological Survey, and Mr. James Deans, of Victoria, B. C., opened up some of them; but the result of the investigation was never published, I think. I shall defer a description of these for a later occasion, my knowledge of them at the present time being too limited for me to speak with any exactitude about them, and confine my remarks to the Mainland group, which seems the more interesting of the two and which received its first systematic examination at the writer's hands, and upon which he feels he may with more propriety speak.

While the Vancouver Island group seems to extend more or less along the coast throughout the Cowitchin area, from beyond Sooke on the southwest to Comox on the east, that on the mainland is confined at present to a narrow strip on the banks of the Fraser extending from the village of Hatzic to Port Hammond.[1] Those opened and examined by myself are found in a cluster on a ranch at Hatzic, on the right bank of the river. These sepulchres, with their ancient mode of burial, belong to a comparatively distant past. The Indians now dwelling in the neighbourhood appear to know nothing of them; disclaim all knowledge of the people who built them and are quite unconcerned at their being opened or disturbed. This indifference in the face of the zealous vigilance they exercise over their own old burial grounds or depositories of the dead is the more striking. The difficulty of procuring osteological data from any of the burial grounds of the modern tribes is well known to any who have attempted to do so, and this unusual indifference displayed towards these mounds by the Indians of the district would seem to suggest that they belong to some antecedent and forgotten tribes. Indeed, an aged Indian of the place informed the writer that his people called them "Ghost heaps"; that they were there when they first came into those parts; that no one knew who made them and that no Indian would approach them on any account. Indian traditions, one knows, are not very reliable data, but in this instance they support the evidence of the mounds themselves and may have a basis of truth in them. Whether they antedate the present tribes or not they were undoubtedly built when a mode of burial prevailed very different from that practised by their ancestors when the whites first came in contact with them; and the osteological data they have yielded reveal a habit of cranial deformation of a kind very unlike that known to have been practised in this region.

These tumuli are interesting, too, apart from the question of their antiquity as they seem to present to us, either a development from simple conceptions and ideas concerning the dead to more advanced and complex ones; or else they mark in a most interesting manner the different degrees of honour their builders were wont to pay to their dead. For they show a markedly graduated transition from simple interment of a body beneath a pile of clay to the construction of comparatively elaborate tombs, composed of a great number of boulders arranged in precise and geometrical order and covered with layers of different kinds of sand and clay. But I shall best describe them if I take them in what seems to me from the evidence their natural order, which I find may be with propriety arranged in a fivefold series. The simplest and first of the series, and, as I am led to believe the oldest, was formed by placing the dead body on the ground somewhat below the level of its surface and

[1] Since the above was written the writer has learned of the existence of another group farther south near the boundary line.

then heaping over it the neighbouring soil; for there are hollows around these mounds showing that the soil of which they are formed was taken from the spot. In all these mounds throughout the whole series, whether simple or otherwise, it should be stated, one body only was ever interred. About this there is no doubt; and this fact of separate, individual interment is the more striking in the more elaborate tombs, which must have occupied many days, if not weeks, in their construction. Many of these simpler and less conspicuous mounds have doubtless been levelled by the ranchers of that neighbourhood without attracting attention; as the bones of the body in these are always found wholly decomposed, with the single exception at times, of a bit of the lower jaw; and their matter has been so closely integrated with the soil that the fact that a body once lay there is only to be discovered by the presence of a darker shade or streak in it; though the enamel casings of the teeth themselves may generally, I think, be recovered if the mounds are opened carefully. Absolutely nothing but the teeth, or their remains, or, as stated before, tiny fragments of the lower jaw, which crumble away in the hand, has been found in these clay mounds; not a vestige of tools, weapons or belongings of any kind. And I may here add that it is one of the singularities of these sepulchres that not a single relic of stone, not so much as a single flake of any kind, has been taken from the whole series, though I have used the greatest care in seeking for them. In this respect the interments in these mounds present a strong contrast to those of the Shuswaps of the sand-hills round Lytton, in which arrow- and spear-heads, flakes and other stone relics are found in great numbers.[1] These clay or earth mounds are of varying dimensions, some of them evidently children's graves, being only a few feet high and a yard or two in diameter; but like the more elaborate ones are always circular in form, and sometimes have a diameter of 20 to 25 feet. Next in the series is a class of mounds formed in part like the last but differing from them in having a pile of boulders heaped up over and around the spot where the body originally lay. The plan of interment in this second class of mounds seems to have been to place the body in the centre of the spot chosen for the grave — whether sitting or prostrate I have not been able to decide, but am inclined to think it was probably doubled-up in some way — and then to surround and heap over it a large pile of boulders; and over these again to heap up earth to a height of from 6 to 9 feet. The third class differs from these only in having a stratum of charcoal, extending over the whole area of the mounds between the boulders and the outer covering of clay, evidently the remains of a large fire. Whether these fires were kindled for sacrificial or for some simpler ceremonial purpose it is impossible from the evidence now to say. The slaughter and cremation of

[1] *Vide* Dr. G. M. Dawson's Notes on the Shuswap People of British Columbia.—Trans. Roy. Soc., Canada, 1891.

slaves, on the death of their owner or chief, is not wholly unknown among the tribes of British Columbia;[1] but whether we see an instance of this practice among these old mound-builders, or whether the fires were lighted in the belief that they comforted the shades of the departed on their journey to the nether world[2] we may never know.[3] The next order of the series differed again from the last in having a large quantity of coarse dark sand in their central parts. It would seem that in constructing these particular graves, after piling up the boulders over the body the builders had covered them with a deep layer of quicksand — which in that district underlies the clay top-soil,—and over this again had strewn a layer of this coarse dark sand. Where they procured this latter sand from I am not able to say. There is none like it in the neighbourhood at present. It is much coarser and darker in colour than that now found in the Fraser near by. But wherever they brought it from they were not sparing of its use. The rancher, on whose farm these tumuli are found, took out from one side of one of these between twenty and thirty sacksful for building purposes; and when I opened it up later there was still a great quantity left in it. This mound is one of the most interesting of the series inasmuch as it accidently presents us with some independent, positive evidence of their antiquity. On one side of its crown the stump of a large cedar tree is seen projecting, the whole in the last stages of decay. To any one who knows anything of the enduring nature of the cedar of British Columbia the evidence which this cedar stump offers will be very convincing. A cedar tree will lie on the ground for a thousand years it is estimated by lumbermen and others, and yet its wood will be firm and good and fit to make up into doors and window-sashes. There is now, not two hundred yards from this mound, a living fir tree growing astraddle over a prostrate cedar log, the age of which, from its dimensions, cannot be much less than five centuries; and yet the wood of the cedar under it is as solid and firm as if it had been cut down yesterday. It is almost impossible to say how long the cedar of this region will endure; and if a claim of one thousand or twelve hundred years be made for the growth and complete decay of this tree, whose roots have crumbled and mouldered away among the bones hidden beneath them for many a long year, most British Columbians will think that a very moderate claim indeed; and it is very probable that a much longer period than that has elapsed since the mound was constructed. This mound is also interesting from the fact

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[1] *Vide* The Rev. Father Morice on the Dénés. — Proceedings of the Canadian Institute, 1892-3.

[2] Longfellow's Legend of Hiawatha.

[3] Prof. Cyrus Thomas in his paper on the mounds in the States in the report previously referred to speaks of a custom which prevailed very extensively among the mound-builders of the northern districts of removing the flesh of the dead bodies before final burial and burning it over the grave when this took place. It is possible these fires were lighted for a similar purpose.

that it is the only one that has yielded any osteological data of importance. Whether from the large quantity of sand in it which may have acted as a drain, or from the fact that this large tree stood over it for many centuries, or from the combination of circumstances, the human remains in this mound have been better preserved, in part, than in the others. The long bones and several others, as well as the skull, were taken out almost whole ; though, unfortunately, all but the skull soon crumbled away. This, happily, I have been able in part to preserve. It is a strangely deformed skull, and in its excessive abnormality is probably without a parallel throughout this region of contorted crania. It does not appear, moreover, to conform to any of the three types known to have been practised in former times on this coast.[1] A bit of a second skull was recovered from one of the other mounds curiously enough preserved, when even the teeth had decayed, leaving nothing but an outline of their form in enamel, by being saturated with the verdigris from a copper ring buried with and alongside it. This piece, though small, is fortunately an important bit. It formed the upper part of the left orbit with adjoining portions of the frontal bone which shows the same extraordinary depression as is seen in the other. From this evidence it would seem that these mound builders practised cranial contortion of a very exaggerated kind and of a type unlike any known elsewhere in British Columbia past or present. Whether the custom will throw any light upon their history or help to identify them remains yet to be seen. To continue the description of the mounds, I may say, the fourth class differs in several essential features from the preceding series. The chief characteristic seen here is an outer rectangular boundary of boulders, set side by side in the form of a square, having each of its sides facing towards one of the cardinal points of the compass like the pyramids of Mexico. This square was apparently laid off before the body was interred, which was placed in the centre and covered as before with a pile of boulders similar to those forming the square. Over these again, and between them and the outer square, a layer of quicksand was placed ; then followed a thin layer of the dark gritty sand found in the other mound ; over this again came more quicksand, followed by a layer of coarse brown sand over the whole extent of the mound extending to and beyond the outer boulders ; and on the top of this the sepulchral fire was kindled. Over the ashes of this fire more quicksand was heaped, followed by the capping of clay. (*Vide* section of this in plate IV.) The base or floor of this mound must have been sunk several feet below the level of the general surface of the land. The mound stood about six feet above the surrounding soil, but its height from top to bottom at the centre was nearly eleven feet. The copper bracelet figured on plate VI. was taken from this mound. The copper awl or spindle shown in the same

[1] *Vide* Sixth Report of the B. A. A. S. on the Northwestern tribes of Canada, pp. 95-96.

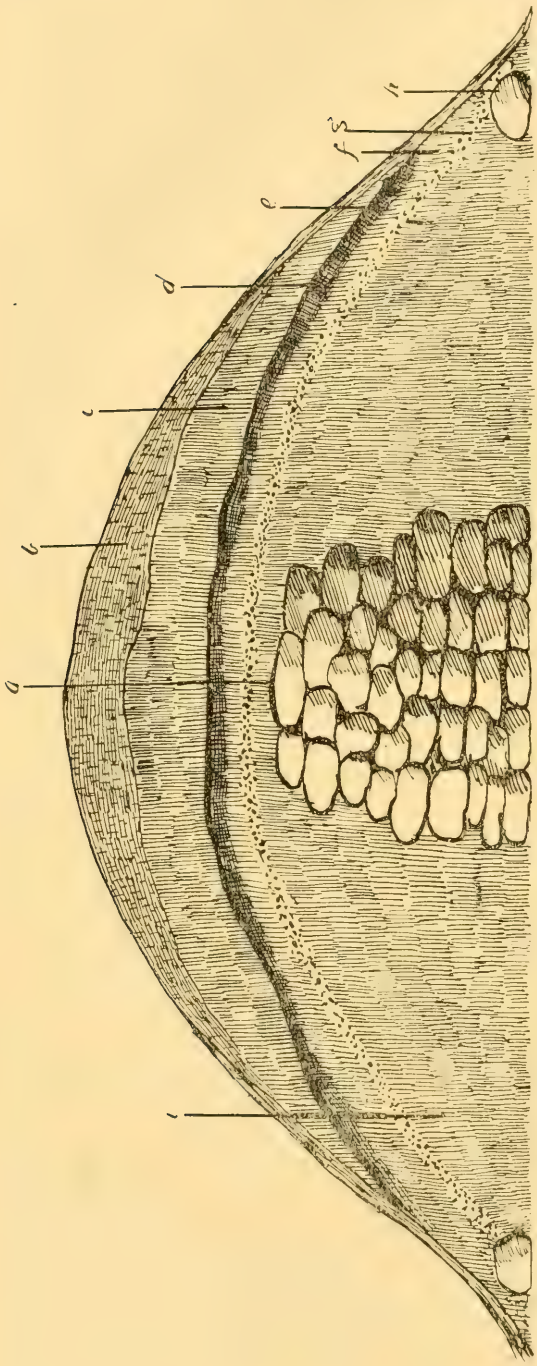
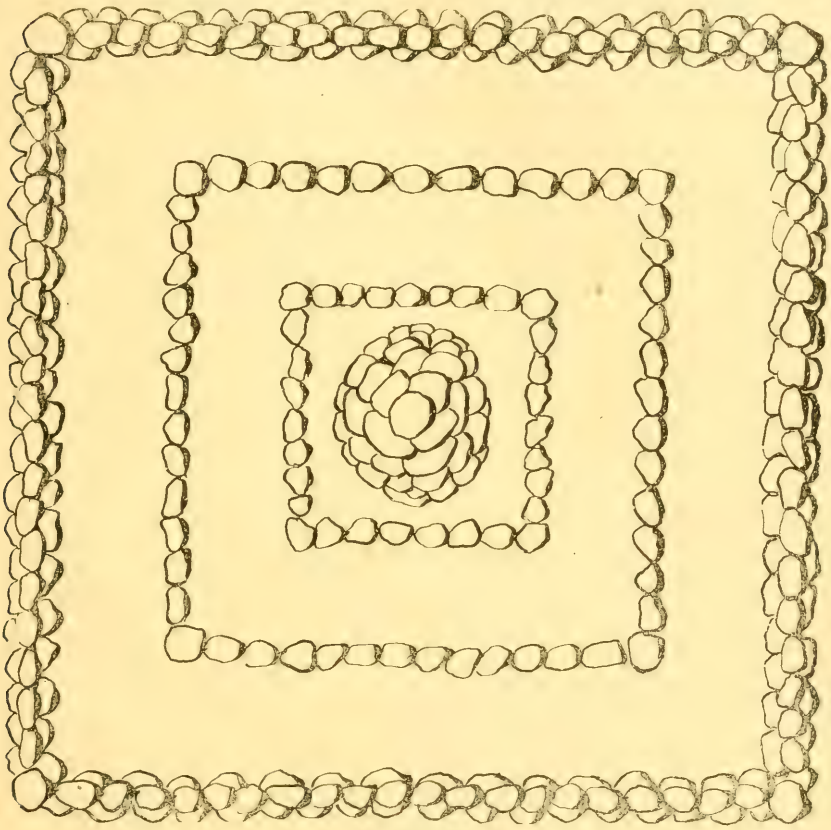


PLATE IV.—SECTION OF MOUND OF FOURTH SERIES.

Explanation of lettering in Plate IV.:

a—Central pile over body.
b—Clay.
c—Quicksand.
d—Charcoal.
e—Coarse brown sand.
f—Quicksand.
g—Dark gritty sand.
h—Outer square of boulders.
i—Quicksand.

plate (3) was taken from the mound in which the skull and bones were found; and the rectangular object (a pair of which was recovered) from a mound of the fifth order. The ring on this plate (4) was taken from a mound of the second class and was the one found in conjunction with the bit of skull before spoken of, inclosed in a fold of hide and wrapped up in a wad of cedar bark. These five copper objects, with the addition of some bits of red ochre, a fragment of coarsely woven blanket of the hair of the mountain sheep and a small quantity of human hair of two colours, black and brown, form the entire collection of relics taken from these mounds.



36 x 36 feet.

PLATE V.—PLAN OF MOUNDS OF FIFTH SERIES.

The next and concluding class of the series shows a considerable advance upon the preceding ones. The plan here, as seen in plate V., is much more elaborate and complex. Instead of the one outer square as in the others formed by a single line of boulders, we have three squares, one within the other; in the innermost of which, beneath the pile of boulders, lay the body; and the outer one is composed in this instance of

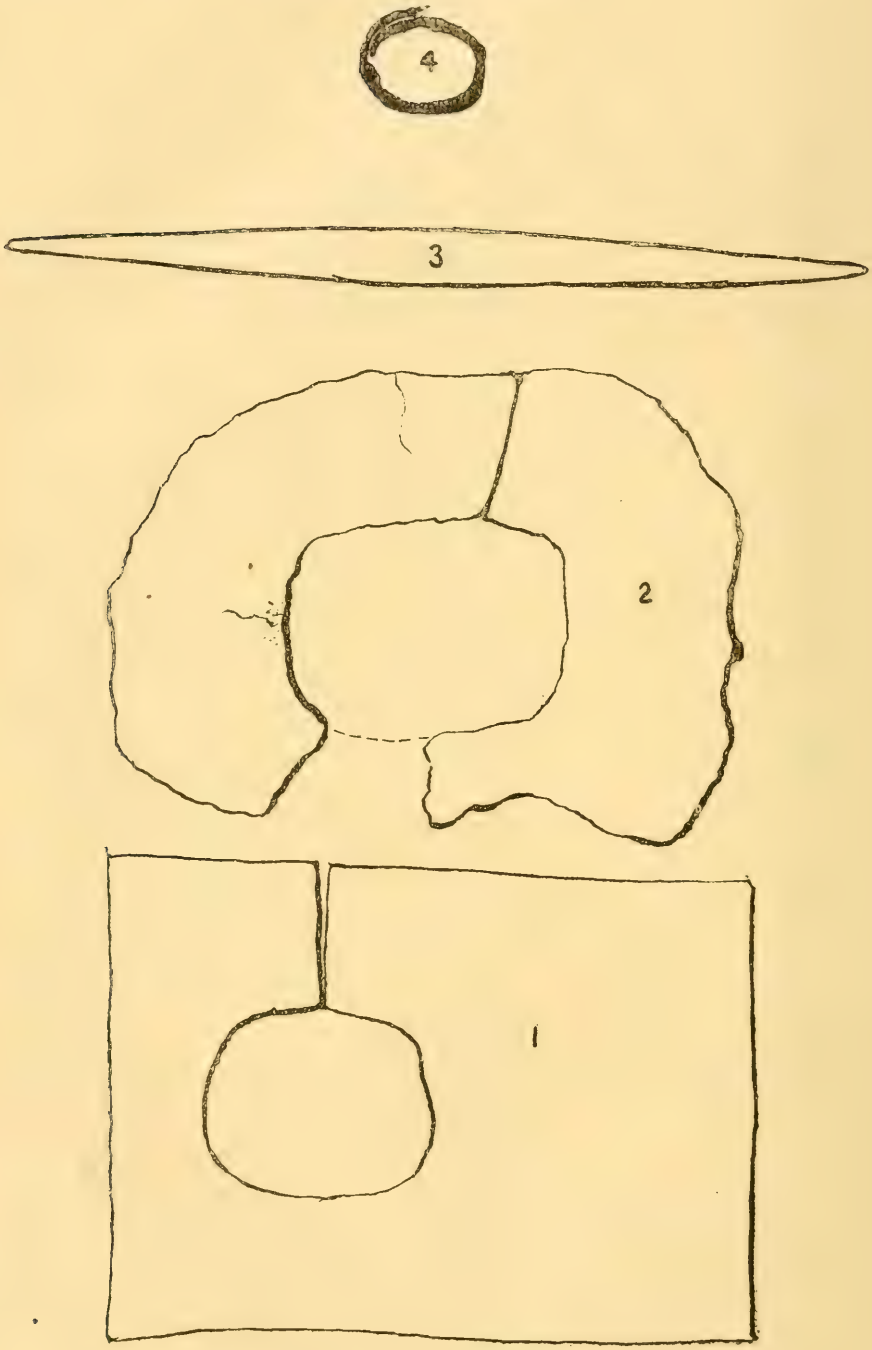


PLATE VI.—COPPER INSTRUMENTS FROM MOUNDS.

two parallel rows of boulders, capped and united by a third. I am sorry to say that the superficial mass of this mound, and another alongside and apparently like it, had been too much disturbed before my attention was drawn to them to allow me to make a section plan of their structure above the boulders, or to speak with any certainty of anything beyond their ground plan. But judging from the others and from the sandy condition of the soil on them, I should be inclined to say they much resembled those of the fourth class in this respect. In connection with this employment of different sands I may state that a number of mounds have recently been opened up on the St. John's River, Florida, the chief characteristic of which seems to be the employment of different kinds of sand in distinct layers.[1]

To give an idea of the labour involved in the construction of these mounds it may be stated that it took a man, with the help of a hand-barrow and other suitable tools, eight days to remove a few yards off the soil only from the underlying boulders of the mound whose ground plan is given in plate V. What time it must have taken the builders to erect one of these more elaborate sepulchres with their inferior tools can easily be imagined. To bring and place the boulders alone must have taken a number of men many days ;[2] and many more must have been consumed in bringing such large quantities of sand in their simple receptacles, and in digging the clay which caps the structure throughout its whole area to a depth of several feet. Some of the mounds of the Vancouver Island group are pyramidal in form. Whether any of these latter ones were of that form originally cannot now be determined. Exteriorly they present the appearance of truncated cones rather than four-sided pyramids, but this may easily be due to time and the elements. The boulders, I may here state, found in these mounds weigh from 25 lbs. up to 200 lbs. each and were apparently brought from some of the mountain-stream beds, no stone of any kind, not even a pebble, being found anywhere on the ranch. There are several of these streams a mile or so back from the river where they might have come from.

In concluding my remarks I trust it may be conceded that the notes I have been able to gather show that the mounds and middens of British Columbia are worthy of the attention of archæologists ; and that we possess in them positive and reliable records of the antiquity and culture-status of the prehistoric tribes of that province. That any degree of civilization higher than that manifested by the Haidas and their neighbours, the Tsimseans, has ever existed in that region, I think, is extremely doubtful ; the evidence from the mounds and middens all tending to strengthen and corroborate what has been gathered from other sources;

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[1] *Vide* "Archæologist" for April, 1895.

[2] The total weight of the boulders in this mound could not be estimated at less than 25 to 30 tons.

that the aborigines of the Northwestern Slope, from the Mackenzie to the Yukon and from that river to the Columbia, if not beyond, had scarcely emerged from primitive savagery and barbarism when Europeans first came in contact with them a little over a century ago.

My best thanks are due to my friend Mr. Carlyle Ellis, of Vancouver, B. C., for his kind assistance in preparing the drawings for the plates accompanying this paper.

REMARKS ON A SKULL FROM BRITISH COLUMBIA.

The fragment of a skull found by Mr. Hill-Tout consists of the roof of the cranium, the right temporal bone, a portion of the face and of the lower jaw. Owing to the pressure sustained in the moist ground the skull is very much deformed, so much so that the adjoining fragments can no longer be fitted together. The parietal bones show long transversal cracks on the surface, near the vertex, which prove that the curvature of the bones of this region has been very much increased. To a still higher degree has this deformation taken place below the obelion. The posterior portion of the frontal bone shows a long crack in antero-posterior direction. The bone is so much flattened that this crack gapes at its lower end. The lower portion of the frontal bone is broken off and is not so much flattened by the pressure of the ground; therefore, the upper and the lower parts of the bone, when fitted together in the middle, do not touch at the sides. The right temporal bone is also broken off. It is less deformed by the pressure of the ground, and is therefore much rounder than the roof of the cranium. The preserved portion of the face includes the malar bone, and, therefore, joins both the frontal and the temporal bones, but cannot be made to fit accurately on account of the post-mortem deformation of the skull.

The cracks of the bones prove that the pressure of the ground was directed against the forehead and the occiput and that it brought about a considerable flattening of the skull. But the lower portion of the forehead shows clearly that during the life of the individual the skull had been deformed in the same manner as is practised by the present Indians of southeastern Vancouver Island, Puget Sound and Fraser River. Skulls of the same type have been found in the stone burials of southeastern Vancouver Island. The excessive flattening which makes the skull similar to Chinook skulls is due to post-mortem deformation. What little remains of the face indicates that its shape resembled the face of the present Indians of this region. The orbit is high and rounded; the nasal bones are wide and low.

The skull seems to have belonged to an elderly woman. Its processes are graceful, and it seems rather small. The jaw is not so large as we are accustomed to find among males of this region. On the inner side all traces of sutures have disappeared, while the upper portion of the coronal suture remains discernable on the outside. The sagittal suture is completely synostosed; the lambdoid suture is very complicated and remains open; the squamous suture is also open. The teeth are not so much worn as might be expected from the advanced state of synostosis of the skull. Their crowns are somewhat worn down, as is always the case with people who eat much food that is cleaned and cooked imperfectly. They are healthy, and no loss of teeth has occurred during life.

The inside of the frontal bone shows a number of nodular exostoses: one on the left side, two large ones and one small one on the right side. Others are found on the inner side of the temporal bone, and still larger ones, but not so well defined, on the parietal bone. The whole region of the obelion is much thickened. According to Dr. M. Prudden, these formations are not of syphilistic origin.

FRANZ BOAS.

VII.—*Haida Grammar.*

By REVEREND C. HARRISON.

(Read May 25, 1892.)

EDITED BY ALEX. F. CHAMBERLAIN, Ph.D.

PREFATORY NOTE (by Editor.)

Those who have occasion to use this Grammar of the Haida Language, may refer with advantage to the notes on this language published by Dr. Franz Boas, in his report to the committee of the British Association for the Advancement of Science in 1888,[1] especially as regards the phonology of Haida speech, and to the Report on the Haidas, by Dr. G. M. Dawson, published by the Geological Survey of Canada in 1878.[2] A Haida vocabulary has also been published by Dr. Boas in the *Proceedings of the American Philosophical Society*, 1891, pp. 183-193.

HISTORICAL AND ETHNOGRAPHICAL INTRODUCTION.

Queen Charlotte Islands.

These islands lie in the Pacific Ocean, between fifty-one and fifty-five degrees of north latitude, adjacent to the northwest coast of America. North Island is the name of the most northerly land, and Cape Saint James is the name of the most southerly point. The islands are about 150 miles in length from north to south. Graham Island is the largest. This island is in some places 60 miles wide.

The Queen Charlotte Islands were discovered, in the year 1774, by Juan Perez, and were then named Cabo de St. Margarita. In the year 1786, La Pérouse, the celebrated French navigator, came to the islands and coasted along the west side of the group. The present name of the islands was given by Captain Dixon, when he anchored at Clarke Bay, in July, 1787. Captain Dixon was in command of the "Queen Charlotte," a vessel of 200 tons burden, and was at the time exploring the west coast on behalf of a London fur company. He then named the islands after George the Third's queen.

In the same year Captain Douglas visited the islands and anchored at Dādans. Captain Marchand, of the French exploring vessel "Solide," also anchored in front of Edenshaw's village, near North Island. He came to the islands in 1791, and accurately recorded some explorations

[1] British Assoc. for the Advancement of Science, Newcastle-upon-Tyne Meeting, 1889. Report on the Northwestern Tribes of Canada, pp. 5-97.

[2] Geological Survey of Canada. Report on Queen Charlotte Islands, 1878. Montreal, 1880, pp. 177-189.

that he made on the west coast. He also studied the native character, and in his account he remarks that "he never saw them armed or distrustful. He followed them into their family circle and found them good husbands and good fathers; he lived several days, as it were, in intimacy with them; he studied them as much as it is possible to do when people explain themselves only by signs; and everything he relates of their manners, their customs, and their character, announces a hospitable, mild, intelligent, laborious and intelligent people, endowed with great good sense, to whom the useful arts are not unknown, who join to these even the agreeable ones, and may be said to have already made considerable advances toward civilization." Dixon on the contrary, charges them with cannibalism, and describes them as dirty, thievish, impudent and murderous people. I believe the Indians on these islands are the finest and fiercest race on the coast. They were once a very powerful nation and the terror of all the surrounding tribes. A hundred years ago they numbered about six thousand. Where are they now? The *gīhangs*, or tall, carved columns, and the quaint old legends connected with them, are still in existence; but the people, they are gone! The boxes in which they buried their dead, fixing them on two large posts, are decaying and fast disappearing, and mummified remains are all that is left of the ancient, skilful and fierce Haidas.

Why have they so decreased? One reason is, that years ago, whole families were swept away by that dreadful epidemic, small-pox. There was then no one to care for them in their sickness, or to speak to them of the Saviour of the world when they were dying. Another reason of their disappearance is that high wages and promise of constant work are held out to them by parties in Victoria, New Westminster and elsewhere, so that they leave their native homes either to die in a few short years by the miserable life they lead, mainly due to the evils of the spirit traffic or return home ruined both in body and soul.

Haida Tribes.

There were formerly thirty-nine Haida villages, but now there are only five, situated at Masset, Skidegate, Gold Harbour, Houkan and Cassan. The latter two are on the American side. The thirty-nine tribes formerly were the

1. *Dū Hāadē*, who lived in a village called Tīan Ilnigē, east of Nesto.
2. *Tas Lennas*, who lived in Tī Ilnigē, near Sisk.
3. *Kais Hāadē*, who lived at Dādans, near North Island.
4. *Shāgwau Lennas*, who lived at Kung, near Virago Sound.
5. *Kunǵwau Lennas*, of Nēdan, in Virago Sound.
6. *Chīchkitonē*, who lived at a village below Yēn.
7. *Stling Lennas*, of Yēn.

8. *Kitāns*, who lived at the west end of Masset.

9. *Sahājūgwan alth Lennas*, who lived in the centre of Masset.

10. *Kiānōsilī*, who lived at a village near Nēdan.

11. *Skidoukou*, who lived in the village now called Masset.

12. *Ou yākū Ilnigē*, who lived on the east side of Masset.

13. *Kwun Lennas*, who lived at Rose Spit.

14. *Shāgwikitonē*, who lived near Yagwun River.

15. *Lthyhellun Kīiwē*, who lived at the Little Mountain.

16. *Nēkwun Kiiwē*, who lived on the north side of Rose Spit.

17. *Nisigas Hāadē*, who lived at the extreme end of Rose Spit.

18. *Lth'ait Lennas*, of Lth'ait, a point of land near Skidegate.

19. *Lthagild*, who lived at Skidegate.

20. *Tlaiyū Hāadē*, who lived at old Gold Harbour.

21. *Khīna Hāadē*, who lived at new Gold Harbour.

22. *Kwun Hāadē*, who lived at Skidanst village. *Kidanst* was the name of the chief of the *Kwun Hāadē*, and when the whites first came to his village they named it after *Kidanst*, the chief, but pronounced it *Skidanst*, which name it still retains.

23. *Skidegate Hāadē*. The chief of the people living at Lthagild was called *Skidegate* when the whites first arrived, therefore they named the village after him, and his people are now called *Skidegates*.

24. *Tanū Hāadē*, who lived near the village of Tlu.

25. *Ängīt Hāadē*, who lived on the east side of Skidanst.

26. *Sahāgungūsilī*, who lived at Masset.

27. *Kouas*, who lived near *Kūstā*, at North Island.

28. *Shongalth Lennas*, of Edenshaw's village, near North Island.

29. *Kūstā Hāadē*. This is a Fort Wrangel word, and applied to the people who formerly lived at Edenshaw's village. This place is now called *Kūstā*.

30. *Stastas*, who lived at Yēn with the Stling Lennas.

31. *Kaiswun Hāadē*, who lived at old Gold Harbour.

32. *Kēo Hāadē*, who lived at Kīgāni.

33. *Tlinkwan Hāadē*, who lived at a village back of Kīgāni.

34. *Kassan Hāadē*, of Oukwuns River, Houkan, near Cape Horn.

35. *Yākwū Lennas*, who lived near Miāgwun Point.

36. *Shākwan Hāadē*, who lived near Houkan.

37. *Kwaihāntlas Hāadē*, who lived near Shākwan.

38. *Houkan Hāadē*, of Tlinkwan, near Kwaizasu.

39. *Kouslē Hāadē*, who lived at Kwaizasu.

The most northerly village is that of the *Tas Lennas* at Tī Ilnigē, near Sisk; the most southerly one is that of the *Ängīt Hāadē*, who live on the east side of Skidanst.

There are doubtless many inaccuracies in the present grammar, as it is a first attempt to reduce the language to writing. I hope, however, there may be something in it that will afford pleasure and be of interest both to the student and the philologist. The principal object in writing this grammar is to afford assistance to my successors in mission work amongst the Haidas, and to those who may desire to gain a knowledge of the language in order to benefit these Indians both temporally and spiritually.

Personal Names.

Before Christianity was introduced amongst the Haidas, a single name was sufficient for each person, and all such names were taken from nature. Now the Christian name is regarded with honour, and is the only one by which some desire to be known. I have, however, retained their old Haida names as the surnames, and have only given each person one Christian name.

The names taken from nature, art, etc., are such as:

Chishalgas,	*Darkness.*
Dūan,	*So*, or *Let it be so.*
Edinso,	*A waterfall.*
Giatlins,	*Standing.*
Gūshoujingwas,	*A long speech.*
Ītilkingān,	*Like us.*
Khungila,	*Easily, Quickly.*
Kintānget,	*A rudder.*
Kwiē,	*Dust.*
Nakadzūt,	*A fox.*
Quaigastins,	*A fleecy cloud.*
Skî,	*A louse.*
Skoual,	*A shellfish like the clam.*
Stlakingān,	*A musical instrument played by hand.*
Stlantanget,	*Soapy, Slippery.*
Yētlth-yūans,	*A large river.*

Tribal Names.

Names of tribes were also taken from natural objects, and some are as follows:

Stastas.—This tribe was so numerous and powerful that they were compared to "maggots on a rotten carcass," and accordingly named *Stastas*, as they were supposed to be as numerous as the maggots, and to be found everywhere.

Shongalth Lennas.—*Shonga* is the name of a large diver which makes a great noise when eating. Edenshaw's people were very numerous formerly, and they also "made a great noise when feasting," hence they were called *Shongalth Lennas.*

Kiānōsilī is the name of Kougay's tribe. *Kiān* is the name of a species of codfish, which have a projection in the chin, and as some were said to be like the codfish about the chin, they were accordingly called *Kiānōsilī*, or "codfish people."

Skidoukou is the name of Laig's tribe. The meaning of this word is "men who could lay eggs and hatch trouble." They were the ringleaders in all wickedness, and caused more trouble than any other tribe, and thus were given this name as a term of reproach. They are also called *Sīgē Lennas.*

Nisigas Hāadē.—This tribe was very dirty, and too idle to build decent houses to live in, hence their name of "the dirty and houseless people."

Shāgwi Kitonē.—*Shāgwi*, "Up;" *Kitonē*, "Eagle." The people of this tribe were called "the men who live on high as the eagle," because they lived in the uppermost village up Masset Inlet.

Kouas.—The men of this tribe were of small stature, and as herring spawn is the smallest spawn found near the islands, they were in contempt called "the herring spawn people."

Tanū Hāadē.—The people of this tribe were very fond of bathing in the sea, and were called "the people who live under salt water." *Tanū* is the Haida name for the long green grass which grows under salt water.

Terms of Relationship.

Relationship is shown by the use of distinct words for the masculine and feminine genders.

Masculine.		Feminine.	
Chinnā,	*Grandfather.*	Nāni,	*Grandmother.*
Aung,	*Father,*	Ou,	*Mother.*
Kāgē,	*Uncle.*	Skān,	*Aunt.*
Kit,	*Child.*	Kit,	*Child.*
Kit ītlingas,	*Son.*	Gwudjana,	*Daughter.*
Kit ītlinga kwaias,	*Eldest son.*	Kit chada kwaias,	*Eldest daughter.*
Kit ītlinga tuanas,	*Youngest son.*	Kit chada tūanas,	*Youngest daughter.*
Ītlinga hutsu,	*Male infant.*	Chada hutsu,	*Female infant.*
Kwunnā,	*Father-in-law.*	Jūnān,	*Mother-in-law.*
Tlāl,	*Husband.*	Chā,	*Wife.*
Kittlāl,	*Son-in-law.*	Kitchā,	*Daughter-in-law.*
Swaunā,	*Brother-in-law.*	Swaunā,	*Sister-in-law.*
Kwai kit ītlingas,	*Eldest brother's nephew.*	Kwai gwudjana,	*Eldest brother's niece.*
Tūan kit ītlingas,	*Youngest brother's* "	Tūan gwudjana,	*Youngest brother's niece.*
Dī alth nung kiiwas,	*Cousin.*		
Dāa,	*Brother.*		
Aung kasil,	*Stepfather.*	(This word is used by *boys* only.)	
Hāt kasil,	*Stepfather.*	(This word is used by *girls* only.)	
Ou kasil,	*Stepmother.*	(This word is used both by girls and boys).	

When brothers are referring to brothers they use the words *Dī kwai* or *Dī tāan* (my eldest or my youngest brother). Sisters also use the same words when referring to other sisters.

Ītlagida,	*Chief, gentleman.*	Itilkitzidā,	*Female chief, lady*
Kitzadalung ītlansidas,	*Male servants.*	Kitzadalung chāadas,	*Female servants.*
Ītlinga,	*Man.*	Chada,	*Woman.*
Ītlansida,	*Men.*	Chāada,	*Women.*

Names of the Months of the Year.

January,	Tān kungas,	The "bear moon."
February,	Lthkittūn kungas,	The "goose moon."
March,	Yhītkāas kungas,	"Laughing geese moon."
April,	Whitgaas,	"Foreign geese moon."
May,	Tāhellē kungas,	The "time that flowers blossom."
June,	Hānskaila kungas,	The "berries begin to ripen this month."
July,	Hānalung kungas,	The "berries are quite ripe this month."
August,	Chīn kungas,	"Salmon moon."
September,	Kishalsh kungas,	"Dog salmon moon."
October,	Kalk kungas,	"Ice moon."
November,	Chāē kungas,	The "bears begin to burrow in the ground this month."
December,	Kwīougē,	"Very cold moon."

December is sometimes called by the old Haidas *Gwougiangas kungas*, i.e., the weather is too cold to sit down when they wish to relieve themselves, and consequently they are compelled to stand up to do it.

I. PHONOLOGY.

A. Vowels.

The Haida language has the following vowel sounds:

A as in	*Fat.*	Klads-ka,	*Strong.*
E "	*Pen.*	Het-li-sta,	*Lumber.*
I "	*Pin.*	Tlīn-o-wē,	*Milk.*
O "	*Not.*	Ot-gwau,	*Last.*
U "	*Nut.*	Tum-an-lth-king,	*Take care.*
Ā "	*Father.*	Kwō-yā-dung,	*Love.*
Ē "	*They.*	Klēlth,	*Five.*
Ī "	*Machine.*	Dī,	*Me.*
Ō "	*Note.*	Kō-gī-na,	*Book.*
Ū "	*Tune.*	Kū-wē,	*Road.*

In addition to these ten vowels, there are also five "imperfect" ones, and every letter which has no proper vowel of its own has an "imperfect" one, either expressed or understood, and is thus marked:

Â as in	*Abroad.*	Lthâalth or Lth'alth,	*Black.*
Ê "	*Open.*	Sê-het-lu or Shet-lu,	*Red huckleberry.*
Î "	*Italy.*	Stî,	*Sickness.*
Ô "	*Collection.*	Tô·kwun-tlo,	*Matches.*
Û "	?	Lthû-ūn-ilth *or* Lth'ūn-ilth,	*Three.*

The other vowel sounds are :

Ai as in *Aisle.*	Kwai-a-lung,	*Elders.*
Au " *Cause.*	Aung,	*Father.*
Oi " *Toil.*	Kwoi-tum-bla,	*Twine.*
Ou " *Mouse.*	Tou,	*Food.*

B. Consonants.

The consonants are *d*, *g*, *h*, *j*, *k*, *ch*, K, KH (Greek χ, German ch), *l*, *m*, *n*, *s*, *t*, *w*, *y*, *z* ; in borrowed words, *p*, *b*.

The letter *B* is very difficult for the Haidas to pronounce. If they wish to say "*b*ig," they invariably say "*p*ig."

The Indians are unable to pronounce *F* and *V* correctly. When they wish to say *V*ictoria, *v*inegar, *f*lute, *f*lour, *f*ound," they distinctly pronounce "*B*ictoria, *b*inegar, *p*lute, *p*lour and *p*ound."

The letters *B*, *F*, *P*, *Q*, *R* and *V* are used only when any English word beginning with one of the above letters is inserted in the Haida language. Thus *buttergē*, *France tligē*, *Princegas*, *Queengas*, *Vinegar* and *rabbitgē*.

The old people always pronounce the letter *R* as *L*. Thus they say "*l*abbit, *l*iver, *l*ice, *l*um, *l*ifle," for "*r*abbit, *r*iver, *r*ice, *r*um and *r*ifle." The young people who attend school are correct in the pronunciation of our English words commencing with R.

The letter *K* is of frequent occurrence in the Haida language, yet when reading the English class books they frequently pronounce *K* as *G*, and thus they say "*g*elp" for "*k*elp," "*g*eep" for "*k*eep," and "*g*ind" for "*k*ind."

When *K* and *Kh* are underlined thus *K*, *Kh*, they correspond to the deep guttural χ in the Greek language, or to the ch of the German.

II. SYLLABIFICATION, ETC.

When two vowels come together they are divided into two syllables, unless they form a diphthong. Dā-ung-a, *wickedness ;* Tla-ou-tlā-lē, *creator ;* Lth-hā-a-da, *people.*

Generally the syllable begins with a consonant, and it is advisable, as far as the pronunciation will allow, to always begin with a consonant, as : Lth-ken-kwas-tan, *frog ;* Lth-kwuns-nung-ki-shou hō-tē, *handkerchief-box.*

The letter G either begins or ends the syllable. When it follows N it must always be pronounced with that letter, and not with the following syllable, as : Ging-gang-an, *worthless.* Whenever the G has a stroke above it, it begins a syllable, as Tung ā lth killāgung, *I thank you :* Dalungīe, *yours ;* Talung kwundungūn, *we heard.*

Prefixes and affixes are generally divided from the root, as : Shā-nung-ītlagidas. *Shā* and *nung* are the prefixes of *ītlagidas* — "the chief

above," i.e., God; Dī kwutungē lāgung. The prefix *dī*, also the affix *lāgung*, is divided from the root, and *kwutungē* remains—kwutungē, *heart;* dī, *my;* lāgung, *good;* i.e., *I am happy.*

Compound words are also divided into syllables, as: kwut-ung-ē-stis, *sorrow.*

When two consonants come together between two vowels they belong to different syllables, as: Kēt-sit-lē, *constable;* Het-li-sta, *lumber;* Hat-gat-shou, *window.*

III. ARTICLES.

The indefinite article is *nung*, as: nung ītlinga, *a man;* nung hāhutsu, *a boy.* It is used only in reference to individuals.

The adjective *swaunshung* is used in reference to places and things as:

Nē ti swaunshung,	*A house.*
Lanna ā swaunshung,	*A town.*
Staskōga ska swaunshung,	*A shoe.*

The definite article *anung* is used in the singular number and refers to individuals only, as:

Anung chada,	*The woman.*
Anung hāhutsu,	*The boy.*
Anung ītlinga,	*The man.*

The definite articles *lth* and *ga—gē* are used in the plural and refer to individuals only:

Lth hāada,	*The men.*	Ga dāungas gē,	*The wicked.*
Lth chāada,	*The women.*	Ga las gē,	*The good.*
Lth hāhudila,	*The children.*	Ga kutungas gē,	*The wise.*

Ā (kin) isis is used in reference to things only.

Ā kin isis lāgung,	*The things are good.*
Ā kōgīna isis lāgung,	*The books are good.*
Ā kōdels isis kladskāgung,	*The coats are strong.*

Sometimes *ā lth isis* is used as the definite article in reference to individuals.

Ā lth hāadē isis dāungang,	*The men are wicked.*
Ā lth hāhudila isis kōnung yūangung,	*The children are very foolish.*
Ā lth hāadā isis wautliwan stigung,	*All the women are ill.*

IV. NOUNS.

A. Number.

The noun has two numbers, the singular and plural. The singular and plural forms are not always distinct, and must be determined always by the verb. In pronouns the distributions of singular and plural are accurately shown. *Lthkittūn, tūsh, stlik'u* and *ettit* are singular in form, and either singular or plural in application, and the verb only must be the guide.

1. Some nouns have a distinct form for the singular and another for the plural.

Ītlinga,	*Man.*	Ītlansidas,	*Men.*
Hāhutsu,	*Boy.*	Hāhudila,	*Boys.*
Hīhutsu,	*Infant.*	Hīhudila,	*Infants.*
Chada,	*Woman.*	Chāada,	*Women.*
Kwutsuwau,	*Hill.*	Kwouwangē,	*Hills.*
Shalang,	*Hymn.*	Saalungai,	*Hymns.*

2. Some also have a different termination, as:

Kwai,	*Elder brother.*	Kwaialung,	*Elder brothers.*
Aung,	*Father.*	Aungalung.	*Fathers.*
Chas,	*Sister.*	Chasalung,	*Sisters.*
Ou,	*Mother.*	Oualung,	*Mothers.*
Kitzad,	*Servant.*	Kitzadalung,	*Servants.*
Chā,	*Wife.*	Chāalung,	*Wives.*
Hānlth yūans,	*Flood.*	Hānlth yūandas,	*Floods.*
Kūwē tumzu,	*Road.*	Kūwē tumdalas,	*Roads.*
Jing,	*Long.*	Jinda,	*Long.*

3. Plurals are also formed from singulars by the suffix —*ilung*.

Kētsitlē,	*Constable.*	Kētsitlē-ilung,	*Constables.*
Kwolthtalē,	*Thief.*	Kwolthtalē-ilung,	*Thieves.*
Tougānlē,	*Gardener.*	Tougānlē-ilung,	*Gardeners.*
Lthāangwilē,	*Workman.*	Lthāangwilē-ilung,	*Workmen.*
Hāēlthtalē,	*Fighter.*	Hāēlthtalē-ilung,	*Fighters.*
Skadadālē,	*Teacher.*	Skadadālē-ilung,	*Teachers.*

4. The plural is also formed by prefixes and suffixes.

Nung ga nungtl itasisu,	*Disciple.*	Ga gahatijan ḡē,	*Disciples.*
Nung dāungas,	*An evil man.*	Ga dāungas ḡē,	*Wicked men.*
Hetgwaulana,	*Devil.*	Ga hetgwaulanagas gē,	*Devils.*
Nung ītlagidas,	*Chief.*	Ga ītlagidas gē,	*Chiefs.*
Nung yetas,	*A believer.*	Ga yetas gē,	*Believers.*
Nung kilthkadungas,	*A liar.*	Ga kilthkadungas gē,	*Liars.*

5. The plural is formed by adding -*ē*, as:

Askaskit,	*Hours.*	Askaskitē,	*Hours.*
Shantlane,	*Day.*	Shantlanē,	*Days.*
Kung,	*Month.*	Kungē,	*Months.*
Tad,	*Year.*	Tadē,	*Years.*

6. Many singular nouns admit of no plural form, as:

Tagwia,	*Power.*	Lagē,	*Goodness.*
Dāla,	*Silver.*	Kwutungēstis,	*Grief.*
Giatlingē,	*News.*	Kāsotouho,	*Gumstick.*
Kwutungē kladska,	*Brave.*	Dela,	*Rain.*
Kwutungētlakwīda,	*Trouble.*		

B. Case.

In Haida nouns the case endings are two, the nominative and genitive, which express, however, three relations, those of the nominative,

accusative, and genitive. The nominative and accusative are the subject and object of the sentence, and the genitive denotes possession. The nominative or subjective case, is used when the noun or pronoun refers to the source or author of an act, as: Shā stātā delgūgung, *it rains from heaven. Shā* is the nominative and denotes the source from which the rain comes.

John adshi aulthkaaungwē tlaoutlaiang, *John made this chair;* John is the nominative. Tānē saats yūangung, *the bear is very wild;* Tānē is the nominative in the sentence.

The accusative or objective case marks the object of a verb distinctly, as:

Tlaou stlik'u tigun,	*I killed the land otter.*
Kāsotouho il kwolthtagun,	*He stole the lamp.*
Wou kōgīna dī ou dī ga istagun,	*My mother gave me that book.*

We thus see that *stlik'u* (land otter), *kāsotouho* (lamp), and *kōgīna* (book) are the objects referred to distinctly by the verbs, and are in the accusative case.

Giē is used to denote the genitive of possession, as: "God is the owner of the book," "Lucy is the owner of the hat," "The nest belongs to the raven:"

Shālana giē kōgīna,	*God's book.*
Lucy giē tātjingē,	*Lucy's hat.*
Yētlth giē lthtelgē,	*Raven's nest.*

In pronouns we have three cases, as:

Laha,	*He.*	Ltha,	*They.*
Laou,	*Him.*	Lthāgiou,	*Theirs.*
Lāgiou,	*His.*	Watalhas,	*Them.*

The adjectives and participles, as in English, have no case endings.

C. Gender.

Gender is the distinction of nouns with regard to sex. The adjectives, participles, and verbs do not denote gender. Gender is expressed:

1. By prefixes, as:

Lth hāhudila,	*Children.*	Lth chāada hudila,	*Girls.*
Lth hāhudila,	*Children.*	Ītlansida hudila,	*Boys.*
Haldunga,	*Slave.*	Lth chada haldunga,	*A female slave.*
Ga lthāangwilas gē,	*Workers.*	Lth chāada lthāangwilasgē,	*Workwomen.*
Ga daungas gē,	*The wicked.*	Ītlansida dāungas,	*Wicked men.*
Itan innas,	*Young people.*	Nung chada itan innas.	*A young woman.*

2. By suffixes.

Tān,	*Bear.*	Tān chada,	*A female bear.*
Tān,	*Bear.*	Tān ītlinga,	*A male bear.*
Skou,	*Poultry.*	Skou chada,	*Hen.*
Kitzadalung,	*Servants.*	Kitzadalung chāadasi,	*Female servants.*
Ettit,	*Bird.*	Ettit ītlinga,	*The male bird.*
Lthkittun,	*Goose.*	Lthkittun ītlinga,	*A gander.*

3. By the use of a distinct word, as:

Chas,	*Sister.*	Dāa,	*Brother.*
Skān,	*Aunt.*	Kāgē,	*Uncle.*
Ou,	*Mother.*	Aung,	*Father.*
Jūnān,	*Mother-in-law.*	Kwunnā,	*Father-in-law.*
Nāni,	*Grandmother.*	Chinna,	*Grandfather.*
Gwudjan,	*Daughter.*	Kit,	*Son.*

The girl, when addressing her *father*, calls him *Hāt*, and the boy calls him *Aung:*

Dī aung dī an kwutungē lāgung,	*My father is pleased with me.*
Dī hāt dāung yūangung,	*My father is very wicked.*
Aung unga ā lth kaiītshang,	*I will go unto my father.*
Hāt unga telga lth kingung,	*I hate my father.*

D. Classes of Nouns.

Nouns are names of places, persons, and things, as:

Places.		Persons.	Things.	
*K*hīna,	*Gold Harbour.*	James.	Kwul,	*Tobacco.*
Nēkwun,	*Rose Spit.*	Cowhoe.	Tatjingē,	*Hat.*
Kaisgwaia,	*North Island.*	Weha.	Stlik'u,	*Land otter.*
Killasu,	*Fort Simpson.*	Thomas.	Tūsh,	*Cat.*
Uttiwas,	*Masset.*	Haias.	Takioun,	*Carpet.*
Tlaihū,	*Skidegate.*	William.	Shibili,	*Flour.*

Nouns are also classified as proper, common, and abstract.

Proper Nouns.

Proper nouns designate individual places, persons, and things, as: Victoria tlīgē, *Victoria;* John, Peter; Shibili, *Flour;* Hinho, *Turnip;* Skū-shīt, *Potato;* Kāsotouho, *Lamp;* Swaunā, *Brother-in-law;* Stlaldigwan, *Mosquito;* Skwul, *Porpoise;* Skuntlou, *A plane.*

Common Nouns.

When we speak of all the things of the same kind we use always the common noun, as:

Tīs,	*Rockbound coast.*	Lth hāada,	*Men.*
Kwaunē,	*Furseal*	Tānē,	*Bears.*
Tlaihū,	*Thread.*	Gioung,	*Cotton.*
Kētsitlēilung,	*Constables.*	Haku,	*Halibut.*

Nouns of quality are also used to show the number, measure, and weight of anything, as:

Kōdets chi stung,	*Two coats.*
Shibili kaskastatla swaunshung,	*One pound of flour.*
Gioung daskaskit swaunshung,	*One yard of cotton.*
Skūshīt *k*ātu sis stung,	*Two sacks of potatoes.*
Kāsotouho kwīdouwē ska stanshung,	*Four measures of "coal oil."*
Kūtiljou tla swaunshung,	*One axe.*

Abstract Nouns.

Tagwia,	*Strength.*	Kwōtal,	*Death.*
Kutunga,	*Wisdom.*	Dāunga,	*Wickedness.*
Kīnglēlth,	*Spring.*	Kwutungē tlakwīda,	*Trouble.*

E. Derivation of Nouns.

1. A few of the Haida nouns are formed from verbs, as:

Tlaou kwīdung,	*I measure.*	Kwidoulē,	*A measurer.*
Tlaou kētsitāng,	*I protect.*	Kētsitlē,	*Protector.*
Tlaou tlinalungung,	*I cook.*	Tlinalunglē,	*Cook.*
Tlaou skadang,	*I learn.*	Skadalē,	*Scholar.*
Tlaou skadadang,	*I teach.*	Skadadālē,	*Teacher*
Tlaou giasougung,	*I pay.*	Giasougunungalē,	*Collector of money.*
Tlaou ltha gūk gūshūgung,	*I preach.*	Ltha gūk gūshsulē,	*Preacher.*
Tlaou waddang,	*I sell.*	Waddalē,	*Storekeeper.*
Tlaou kwolthtang,	*I steal.*	Kwolthtalē,	*Thief.*
Tuman lth kingung,	*I take care of.*	Tuman nung kings,	*Steward.*
Tligē lth kwīdung,	*I survey.*	Tilga kwidoule,	*Surveyor.*

2. We have also nouns formed from other nouns by the suffix *-tē.*

Tougān,	*Garden.*	Tougānlē,	*Gardener.*
Kontluwē,	*Boat.*	Kontluwēlē,	*Boatman.*
Lthāangwil,	*Work.*	Lthāangwilē,	*Workman.*
Kūtīljou,	*Axe.*	Kūtīljoulē,	*Axeman.*
Katkinganu,	*Bell.*	Katkinganlē,	*Bellringer.*
Dāla.	*Money.*	Dālālē,	*Banker.*
Nē,	*House.*	Nēlē,	*Householder.*

3. Also nouns are formed from other nouns by the suffix *-nē.*

Singelthkanggūshou,	*Prayer.*	Singelthkanggūshounē,	*Church.*
Nāng,	*Play.*	Nāngnē,	*Play-house, theatre,*
Kōgīna,	*Book.*	Kōgīnanē,	*Library.*
Tlinalung,	*Cook.*	Tlinalungnē,	*Kitchen.*
Kiutan,	*Horse.*	Kiutannē,	*Stable.*
Katsou,	*Song.*	Katsounē,	*Music hall.*

4. Place nouns are formed by the affix *alītzan*, as:

Tlaou tīdang,	*I sleep.*
Tlaou zing unga kōkopitung,	*I gnash.*
Tlaou īching,	*I am.*
Talung naangung,	*We dwell.*
Zanowē talung skinanungang,	*We cut wood.*
Talung istiēdang,	*We go.*
Tlītzan lthatīdas,	*Sleeping-place.*
Tlītzan lha zing unga kōkopitas,	*Where there is gnashing.*
Tlītzan lth isis,	*Where I am.*
Tlītzan talung naans,	*Our dwelling place.*
Tlītzan zanowē talung shinanunguns,	*Where we chop wood.*
Tlītzan talung istiēdas,	*Where we go,* i.e. *our destination.*

5. We have also nouns formed from verbs by prefixing *nung* and omitting the last syllable of the verb, as:

Tlaou kwōyādung,	*I love.*	Nung kwōyādas,	*A lover.*
Tlaou hāēlthtang,	*I fight.*	Nung hāēlthtas,	*A fighter.*
Tlaou kwolthtang,	*I steal.*	Nung kwolthtas,	*A thief.*
Tlaou tumankingung,	*I take care of.*	Nung tumankings,	*A caretaker.*
Tlaou kāgung,	*I walk.*	Nung kās,	*A walker.*
Dī stigung,	*I am ill.*	Nung stis,	*A sick person.*

6. If in the plural, the word *ga* is prefixed and *gē* affixed to the verb, as:

Talun istalgung,	*We walk.*	Ga istals gē,	*The walkers.*
Talung tlitāng,	*We kill.*	Ga tlitās gē,	*The murderers.*
Talung yetang,	*We believe.*	Ga yetas gē,	*The believers.*
Talung kālungāgung,	*We write.*	Ga kālungas gē,	*The scribes.*
Talung kwōyādung,	*We love.*	Ga kwōyādas gē.	*The lover.*
Ītil dāungang,	*We are wicked.*	Ga dāungas gē,	*The wicked.*
Ītil lāgung,	*We are good.*	Ga lās gē,	*The good.*

7. Nouns are also formed by the prefix *ltha*, and the omission of the last syllable of the verb. Only used in the plural.

Talung telgakingung,	*We hate.*	Telga ltha kings,	*The enemies.*
Dalung istlāgung,	*You come.*	Ltha istlās gē,	*The comers* or *the expected.*
Ltha kwutungē kladskagung,	*They are brave.*	Ltha kwuntungē kladskas,	*The brave.*
Dalung hāagāgung,	*Ye are weak.*	Ltha hāagas,	*The weak.*
Ltha stigung,	*They are ill.*	Ltha stis,	*The sick.*
Ītil tagwiāgung,	*We are strong.*	Ltha tagwiās,	*The strong.*

V. PRONOUNS.

A. Personal Pronouns.

1. *Personal Nominative Pronouns.*

Tlaou,	*I.*	Dahou,	*Thou.*
Laou,	*He, she.*	Ou	*It.*
Talung,	*We.*	Dalung,	*Ye*
Ltha,	*They.*		

Laou is also used for the third person plural if only a few persons or things are referred to, and the difference is shown by the verb. *Laou* is also common for both the masculine and feminine genders third person singular.

2. *Personal Objective Pronouns.*

Dī,	*Me.*	Dāha,	*Thee.*
Lā,	*Him.*	Ītil,	*Us.*
Dalung,	*Ye.*	Wātaltas,	*Them.*

Possessive Pronouns.

Dī	*My,*	Dung,	*Your.*
Il,	*His, hers, its.*	Ītil,	*Ours.*
Dalung,	*Yours.*	Ltha,	*Theirs.*

Il is also used for the third person plural if only a few persons or things are referred to, and the difference between the third person singular and *Il* the third person plural is shown by the verb.

3. *Reflexive Possessive Pronouns.*

Giang,	*My own.*	Kiagin,	*Mine.*
Dungiou,	*Your own.*	Lāgiou,	*His own, her own.*
Ītilgiou,	*Our own.*	Dalungiou,	*Your own.*
Lthāgiou,	*Their own.*		

Lāgiou is also used for the third person plural if only a few persons are referred to.

4. *Definite Possessive Pronouns.*

Dī na,	*Mine.*	Dānga,	*Yours.*
Langa,	*His, hers.*	Ītlanga,	*Us.*
Dalanga,	*Yours.*	Lthanga,	*Their.*

5. *Objective Pronouns.*

Dī-ā,	*To me.*	Dahā,	*Thee.*
Lahā,	*Him.*	Ītlā,	*Us.*
Dalungā,	*Ye,*	Lthaā,	*Them.*

B. Relative Pronouns.

Kīstho,	*Who.*	(Singular.)	Kītildou,	*Who.*	(Plural)
Atlanis,	*This one.*	(Not visible.)	Ashgē,	*These.*	
Althsgē,	*These.*	(Not visible.)	Washgē,	*Those.*	
Kinaso,	*Which.*		Adshi,	*This.*	
Wadshi,	*That.*		Hinu,	*As, thus.*	
Tliku,	*What, as.*				

C. Demonstrative Pronouns.

Anis,	*This.*	Refers to *persons* only.
Wunis,	*That.*	" " "
Adaltas,	*These.*	" " "
Wadaltas,	*Those.*	" " "
Adshi,	*This.*	Refers to *things* and *places* only.
Wadshi,	*That.*	" " " "
Ou kin isis,	*These.*	Refers to *things* only.
Wou kin isis,	*Those.*	" " "
Ougus,	*These.*	" " "
Wougus,	*Those.*	" " "
Ashgē,	*These.*	" " "
Washgē,	*Those.*	" " "
Tliku,	*What, as.*	
Hinu,	*As, thus.*	
Kingān,	*Same as.*	
Waikingān,	*The same.*	
Kwutkingān,	*Selfsame.*	Refers to *things* only.

D. Interrogative Pronouns.

Kīstho,	*Who?*	(Singular.)	Kītildou,	*Who?*	(Plural.)
Gūshu,	*What?*		Kinasu,	*Which?*	(Singular.)
Kishgaiu,	*Which?*	(Plural.)	Kasino,	*How, what?*	
Kīstaḡiou,	*Whose?*	(Singular.)	Kītildaḡiou,	*Whose?*	(Plural.)
Kīslu,	*How many, how?*				

Kasin tatjing ed gu dung istatlang? *What hat do you want?*
Kīslu tluwē dānga giagāḡung? *How big is your canoe?*

E. Reflexive Pronouns.

The reflexive pronoun is formed by adding *agung* to the personal pronoun, as:

Tlaou agung,	*I myself.*	Dahou agung,	*Yourself.*
Laou agung,	*Himself.*	Agung talung,	*Ourselves.*
Agung dalung,	*Yourselves.*	Agung laou *or* ugung ltha.	*Themselves.*

F. Reciprocal Pronouns.

Gwuda talung (kwōyādung),	*We love one another.*
Gwuda dalung (kwōyādung),	*Ye " " "*
Gwuda ltha (kwōyādung),	*They " " "*

G. Indefinite and Distributive Pronouns.

Kinhān,	*Any.*
Lth wautliwan hanu,	*Each one.*
Tlinashan,	*Either.*
Kum tlinashan,	*Neither.*
Kalat,	*Other.*
Adda,	*Other.*
Kinasu,	*Which of two.*
Adshi isken waigen kalat ishīn,	*Both one and the other.*
Tliku kālungāsi han,	*Of any sort.*
Tliku kālungē edsi han,	*Of any size.*
Swaunshung,	*One.*
Ga kalat,	*Others.*
Ga adda,	*Others.*

Examples of Possessive Pronouns.

Kiagin ū īching,	*It is mine.*
Dunḡiou īching,	*It is yours.*
Lāgiou īching,	*It is his.*
Ītilgiou īching,	*It is ours.*
Dalunḡiou īching,	*It is yours.*
Lthāgiou īching,	*It is theirs.*
Kiagin nē ū īching,	*It is my house.*
Tatjingē lth unga ista,	*Get your hat.*
Dungiou kōdetsē lāḡung,	*Your coat is good.*
Lāgiou kōgīna dāungang,	*His book is bad.*
Ītilgiou kum lānḡung,	*Ours is no good.*
Dalunḡiou statilthdouwē kīgāgung,	*Your stockings are worn out.*
Lthagiou staskōḡa kladskāgung,	*Their boots are strong.*

NOTE.—*Unga* may be used only when the subject is doing something to or with his own goods or relations and it has the full possessive force.

Aung unga ā lth kautshang,	*I will go unto my father.*
Kūtiljou althgwi unga lth ista,	*Bring your own axe.*
Kit unga lth kwoyādung,	*I love my child.*
Tliga unga gwi ltha stilgun,	*They returned to their own country.*
Nē gwi unga lth stilgung,	*I return home,* e.g. *to my own house.*
Kwutungē unga lth kladskāds,	*Strengthen your hearts.*

General Examples.

Kīstho īching?	*Who is it?*
Tlaou īching,	*It is I.*
Gūshgu dung istang?	*What are you doing?*
Kwul gu dung dā us?	*Have you any tobacco?*
Kistho dung īching?	*Who are you?*
Tlaou James īching,	*I am James.*
Kinasu ga dung istatlung?	*Which (of two) do you want?*
Kishgaiu ga il istatlang?	*Which (of many) does he want?*
Nung kalat dī ga lth ista,	*Give me the other.*
Kum nung kalat lth dāanḡung,	*I have no other.*
Ītil kingānu īl ēdung,	*He is like us.*
Lth hāada tītch dāungang,	*Some of the people are wicked.*

VI. ADJECTIVES.

An adjective denotes a quality appended to the noun without stating definitely that the quality belongs to it. The position of the adjective in a sentence is always after the noun.

Nung ītlinga lā.	Staskōḡa kladska.	Kōḡīna dāunga.
A man good.	*Book strong.*	*Book bad.*
Kōḡīna staia.	Tatjingē houtla	Gioung s'het.
Paper thin.	*Hat new.*	*Cotton red.*

In very many languages this agreement is shown by the termination, but it is not so in the Haida. The adjectives in this language chiefly terminate with *a*, and most of the nouns have the same ending, and thus, in a slight degree, the adjectives may be said to be of the same gender, number, and case as the nouns.

Adjectives are classified as definitive, qualitative and quantitative.

1. Definitive adjectives denote a thing from its class, and thus the indefinite and definite articles are also called adjectives:

Nung ītlinga,	*A man.*	Anung ītlingas,	*The man.*
Adshi kōḡīna,	*This book.*	Wou lamatoē isis,	*That sheep.*
Lāḡiou skatlangwē,	*His cup.*	Dunḡiou kāsotouho,	*Your lamp.*
Dalunḡiou aulthkaaungwē,	*Your seals.*	Lthāḡiou kiutanē,	*Their horses.*
Ītilgiou staskōḡa,	*Our boots.*	Anung chadas,	*The woman.*

2. Qualitative adjectives denote the quality of the nouns, as:

Nung ītlinga kutungas,	Kwutungē skēla.
A man wise.	*Heart unclean.*
Nung chada zuējing.	Shantlan dāunga.
A woman tall.	*Day bad.*
Kōdets gunga.	Statilthdou lā yūan.
Coat thick.	*Stockings good very.*

3. When we wish to distinguish anything according to its number either definitely, indefinitely, or distributively, we use the quantitative adjective, as:

Lthāada klālth, *ten men.* This denotes the *definite* number. Kōdets gu hutsū, *a few coats.* This denotes the *indefinite* number. Dalung wautliwan, *all of you.* This is used *distributively.*

Examples.

Nung chada dāunga.	Takioun lā.
A woman bad.	*Carpet good.*
Kōgīna kutungas.	Kil kladska.
Book wise.	*Voice strong.*
Hangi skēla.	Kwutungē skwuna.
Face dirty.	*Heart clean.*

Chada, takioun, kōgīna, kil, hangi and *kwutungē* are nouns, and *dāunga, lā, kutungas, kladska, skēla,* and *skwuna* are adjectives denoting the quality or importance of each noun.

Examples.

Laou nung hāhutsu dāunga īching.
He a boy wicked is.

Īṭil lth hāada kutungas kum kin dāunga istiē da kwudungāngung.
We the men wise not thing wicked do to wish.

Talung gūshou ginggangan eds kwōyādagungung.
We talk worthless are loving.

Thus *nung hāhutsu dāunga, lth haāda kutungas,* and *gūshou ginggangan eds* are used to denote the quality of the pronouns *laou, ītīl* and *talung.*

4. Comparison.

There are three usual degrees of comparison, the positive, the comparative and the superlative.

A. COMPARATIVE DEGREE.

The comparative is formed by adding *ēdung* to the stem or root.

Positive.		Comparative.	
Dāunga,	*Bad.*	Dāunga ēdung,	*Worse.*
Lā,	*Good.*	Lā ēdung,	*Better.*
Jing,	*Far.*	Jinga ēdung,	*Farther.*
Jingelgung,	*Late.*	Jingēlth ēdung,	*Later.*
Houla,	*Sweet.*	Houla ēdung,	*Sweeter.*
Hougut,	*Bitter.*	Hougut ēdung,	*More bitter.*

2. The comparative is sometimes formed by prefixing *wauhangast* to the positive degree, as :

Positive.		Comparative.
Hutsu,	*Small.*	Wauhangast i hutsu.
Khauga,	*Tiny.*	Wauhangast i khauga.
Sūtsu,	*Little.*	Wauhangast i sūtsu.

3. The comparative is also formed by the prefix *wautelgu.*

Kwan,	*Many.*	Wautelgu kwan,	*More.*
Dūunga,	*Near.*	Wautelgu dūunga,	*Nearer.*
Yūan,	*Big, Great.*	Wautelgu yūan,	*Greater, Bigger.*
Kwunan,	*Much.*	Wautelgu kwan yūan,	*More.*
Lāgung,	*Good.*	Wautelgu lāgung,	*Better.*

Wautelgu waigen houshen wautelga, *More and more.*

4. *Kingān* is sometimes added to the positive degree and makes the comparative, as :

Positive.		Comparative.	
Hēt,	*Low.*	Hēt kingān.	*Lower.*
Hēnung,	*Low.*	Hēnung kingān,	*Lower.*
Shā,	*High.*	Shā kingān,	*Higher.*
Kiakgust,	*Outside.*	Kiakgust kingān,	*Outer.*
Otgwau,	*Last.*	Otgwau kingān,	*Last.*

5. The irregular comparatives are :

Positive.		Comparative		
Kīā,	*Old.*	Kīāsitli,		*Older,*
Kiā,	*Out.*	Kiakgust kingān,		*Outer, Utter.*
Gu hutsu,	*Few.*	Gu sūtsu,		*Fewer.*
Kwunna,	*First.*	Lagūst,		*Next.*
Ostla,	*Fore*	Gūst,	*Former.*	Refers to *persons* only.
Itan kingān,	*Fore.*	Awolth,	*Former.*	Refers to *time* only.

B. SUPERLATIVE DEGREE.

1. The superlatative is formed by adding *agwi* or *sitlth līgung* to the root, as :

Positive.		Comparative.	
Kīā,	*Old*	Kīāsitli,	*Elder.*
Kiā,	*Out.*	Kiakgust kingān,	*Outer.*
Gu hutsui	*Few.*	Gu sūtsu;	*Fewer.*
Hēt,	*Low.*	Hēt kingān,	*Lower.*
Hēnung,	*Low.*	Hēnung kingān,	*Lower.*
Shā,	*High.*	Shā kingān,	*Higher.*
Sīnung,	*High.*	Sīnung kingān,	*Higher.*
Yūan,	*Great.*	Wautelgu yūan,	*Greater.*
Dāunga,	*Bad.*	Dāunga ēdung,	*Worse.*
Lā,	*Good.*	Lāīd *or* Lā ēdung,	*Better.*
Jinga,	*Far.*	Jinga ēdung,	*Farther.*
Wadshgwau,	*Far.*	Jingelth ēdung,	*Later.*
Jingelgung,	*Late.*	Otgwau kingān,	*Last.*

Otgwau,	*Last.*	Lagūst,	*Next.*
Kwunna,	*First.*	Gūst,	*Former.*
Ostla,	*Fore.*	Awolth,	*Former.*
Itan kingān,	*Fore.*	Wauhangast hutsu,	*Less.*
Hutsu,	*Little.*	Wautelgu kwan,	*More.*
Kwan,	*Many.*	Wautelgu kwan yūan,	*More.*
Kwunan,	*Much.*	Wautelgu dūunga,	*Nearer, Near.*
Dūunga,	*Nigh.*		

Dung an dē ānāgung,	*I am near you.*
Dī gūst il kouwang,	*He sits next to me.*
An dī dūungāgung,	*I am near.*
Laou wautelgu dāung yūangung,	*He is the worst*, or,
Laou dāunga sitlthtigung,	*He is the worst.*
Tligi jinga ā il kaiitan,	*He has gone into a far country.*
Dung jingēlth sitlthtigung,	*You are the latest or last.*

SUPERLATIVE.

Kiāsitlīgung, kīdāangada,	*Eldest.*
Kiakgust agwi, *Outermost*, Ostliē,	*Utmost.*
Gu sitlthlīgung,	*Fewest.*
Hēt agwi,	*Lowest.*
Hēnung agwi,	*Highest.*
Shā agwi,	*Highest.*
Sīnung agwi,	*Highest.*
Wautelgu agwi yūan,	*Greatest.*
Dāunga sitlthlīgung,	*Worst.*
Lā sitlthlīgung,	*Best.*
Jinga sitlthlīgung *or* Jingelth sitlthlīgung,	*Latest.*
Otgwau agwi,	*The very last.*
Yakwultan,	*Nearest.*
Katlthuzu,	*Foremost.*
Tlaglu,	*Foremost.*
Wauhangast agwi sūga, wauhangastagwi hutsu, Wauhangast agwi sutsu,	*Most.*
Wautelgu agwi kwan,	*Most.*
Wautelgu agwi kwan yūan,	*Most.*
Wautelgu agwi dūunga,	*Nearest.*

Ostla refers to *persons* only, also its comparative and superlative degrees.

Itan kingan, *awolth*, and *tlaglu* refer to *time* only.

5. INDEFINITE NUMERALS.

Wautliwan,	*All.*	Ltha wautliwan hanu,	*Each.*	Kwan,	*Many.*
Kinhān,	*Any.*	Kwaūēlthīdung,	*Enough.*	Īdung,	*Enough.*
Tītch,	*Some.*	Tlinashan,	*Either.*	Chikun,	*Several.*
Gwudilaed,	*Divers.*	Suhutsūs,	*Few.*	Stungan,	*Both.*
Ītlī,	*Certain.*	Stāīdung,	*Enough.*		

The above are called adjectives and are applied only to quantity and numbers, as :

Lth hāada wautliwan,	*All people.*
Stungan dāungang,	*Both are wicked.*

Lth hāada gwudila ed stīgung,	*Divers people are ill.*
Ltha wautliwau hanu dī ga lth ista,	*Give me each one.*
Lth hāada kwan lth kingung,	*I see many people.*
Kin gu hutsūs swaunan lāgung,	*Only a few things are good.*
Lth hāada ītlī skunzalung yūangung,	*Certain people are very lazy.*
Tlinashan gu dung istatlang,	*Do you want either of them.*
Kōdets tītch swaunan kladskāgung,	*A few coats only are strong.*

6. Definite Numerals.

CARDINALS.		CARDINALS.	
Swaunshung,	*One.*	Lthūunilth,	*Six.*
Stung,	*Two.*	Chigwau,	*Seven.*
Lth'ūnilth,	*Three.*	Stanshanga,	*Eight.*
Stanshūng,	*Four.*	Klālthswansingu,	*Nine.*
Klēlth,	*Five.*	Klāalth,	*Ten.*

The numbers above ten are formed by adding *one, two, three,* &c., to the numeral *ten* as :

Klālth wok swaunshung,	*Eleven.*	Klālth wok lthūunilth,	*Sixteen.*
Klālth wok stung	*Twelve.*	Klālth wok chigwau,	*Seventeen.*
Klālth wok lth'ūnilth,	*Thirteen.*	Klālth wok stanshanga,	*Eighteen.*
Klālth wok stanshung,	*Fourteen.*	Klālth wok klalthswansingu,	*Nineteen.*
Klālth wok klēlth,	*Fifteen.*	Klālē stung,	*Twenty.*

Sometimes *lagwau swaunshung* is used for "Twenty."

The numbers above *twenty* are formed by adding *one, two, three,* &c , to *twenty,* as :

Lagwau swaunshung wok swaunshung,	*Twenty-one.*
Lagwau swaunshung wok stung,	*Twenty-two.*
Lagwau swaunshung wok lth'ūnilth,	*Twenty-three.*
Lagwau swaunshung wok stanshung,	*Twenty-four.*
Lagwau swaunshung wok klēlth, &c.,	*Twenty-five, etc.*
Klālē lth'ūnilth,	*Thirty.*
Klālē lth'ūnilth wok swaunshung,	*Thirty-one.*
Klālē lth'ūnilth wok stung, etc,,	*Thirty-two, etc.*
Lagwau stung,	*Forty.*
Lagwau stung wok swaunshung,	*Forty-one.*
Lagwau stung wok stung, &c.,	*Forty-two, etc.*
Klālē klēlth,	*Fifty.*
Klālē klēlth wok swaunshung,	*Fifty-one.*
Klālē klēlth wok stung, &c.,	*Fifty-two, etc.*
Lagwau lth'ūnilth,	*Sixty.*
Lagwau lth'ūnilth wok swaunshung,	*Sixty-one.*
Lagwau lth'ūnilth wok stung, &c.,	*Sixty-two.*
Klālē chigwau,	*Seventy.*
Klālē chigwau wok swaunshung,	*Seventy-one.*
Klālē chigwau wok stung, &c.,	*Seventy-two, etc.*
Lagwau stanshung,	*Eighty.*
Lagwau stanshung wok swaunshung,	*Eighty-one.*
Lagwau stanshung wok stung, &c.,	*Eighty-two, etc.*

Klālē klālthswansingū,	*Ninety.*
Klālē klālthswansingū wok swaunshung,	*Ninety-one.*
Klālē klālthswansingū wok stung, &c.,	*Ninety-two, etc.*
Lagwau klēlth,	*One hundred.*
Lagwau klēlth wok swaunshung,	*One hundred and one.*
Lagwau klēlth wok stung,	*One hundred and two.*
Lagwau klēlth wok klālth,	*One hundred and ten.*
Lagwau lthūunilth,	*One hundred and twenty.*
Lagwau lthūunilth wok klālth,	*One hundred and thirty.*
Lagwau chigwau,	*One hundred and forty.*
Lagwau chigwau wok klālth,	*One hundred and fifty.*
Lagwau stanshanga,	*One hundred and sixty.*
Lagwau stanshanga wok klālth,	*One hundred and seventy.*
Lagwau klālthswansingū,	*One hundred and eighty.*
Lagwau klālthswansingū wok klālth,	*One hundred and ninety.*
Lagwau klālth,	*Two hundred.*
Lagwau klālth wok lagwau klēlth,	*Three hundred.*
Lagwau klālē stung,	*Four hundred.*
Lagwau klālē stung wok lagwau klēlth,	*Five hundred.*
Lagwau klālē lth'ūnilth,	*Six hundred.*
Lagwau klālē lth'ūnilth wok lagwau klēlth,	*Seven hundred.*
Lagwau klālē stanshung,	*Eight hundred.*
Lagwau klālē stanshung wok lagwau klēlth,	*Nine hundred.*
Lagwau klālē klēlth,	*One thousand.*

If more than a thousand is required to be expressed the Indians generally say *lagwau klālē kwan*, i.e. "more than can be counted," as they are so numerous.

7. Numeral Prefixes.

Each numeral has a prefix or middle word. This prefix varies according to the noun with which it is connected, and distinguishes the articles referred to as square, thick, round, etc. In point of fact it is used to denote the quality of the noun to which it is attached.

1. *Ki* is used to denote "anything round," as:

Dāla *ki* swaunshung,	*One dollar.*
Watchgē *ki* stung,	*Two watches.*
Shibili hūga *ki* lth'ūnilth,	*Three loaves of bread.*
Kāsotouho *ki* swaunshung,	*One lamp.*
Gilk *ki* klēlth,	*One biscuit.*

Sa refers to "hymns, whips," etc.

Shalang sa swaunshung,	*One hymn.*
Staskōga dunsitawē sa swaunshung,	*One bootlace.*
Kūwē sa stanshung,	*Four roads.*
Saalungai sa klēlth,	*Five hymns.*
Kiutan skidangwē sa klālth,	*Ten whips.*
Goudjou *or* gūdjou sa klēlth,	*Five drums.*

3. *Ti* refers to "houses, brushes, and waves."

Nē ti stung,	*Two houses.*
Tlakioudal ti klēlth,	*Five brushes.*
Lū ti stanshung,	*Four waves.*

4. *Saasgud* refers to "time" only

Minute saasgud,	*One minute.*	Askaskit saasgud,	*One hour.*
Sin saasgud,	*One day.*	Sundiga saagud,	*One week.*
Kung saasgud,	*One month.*	Tada saasgud,	*One year.*

5. *Saaskwan* refers to "land, lumber," &c.

Tligē stung saaskwan,	*Two pieces of land.*
Ilnige saaskwan,	*One village.*
Zu saaskwan,	*One piece of cedar.*
Hetlista saaskwan,	*One piece of lumber.*
Kwutungē saaskwan,	*One whole heart.*
Kwai saaskwan,	*One entire rope.*

6. *Tliskwan* refers to "the body, clothes," &c.

Tlu tliskwan,	*One body.*
Kin giandas tliskwan,	*One suit of clothes.*
Chin glinanda tliskwan,	*One salmon.*
Ettit tliskwan,	*One bird.*

7. *Ta* refers to "ropes" only.

Kwai ta stung,	*Two ropes.*
Kwai ta klālth,	*Ten ropes.*
Kwai ta chigwau,	*Seven ropes.*

8. *Chi* refers to "the hands, feet," &c.

Stlē chi stung,	*Two hands.*
Stai chi klēlth,	*Five feet.*
Nu chi lth'ūnilth,	*Three devil fish.*
Kwun chi swaunshung,	*One nose.*
Skwustou chi stanshung,	*Four vests.*
Shibili gwaulē chi stanshanga,	*Eight sacks of flour.*

9. *Skā* refers to "the eye, eggs, boots," &c.

Hangi skā swaunshung,	*One eye.*	Staskōga skā stung,	*Two boots.*
Chiku skā lth'ūnilth,	*Three guns.*	Khou skā staushung,	*Four eggs.*
Kālungē skā klēlth,	*Five pencils.*	Stlin skā lthūunilth,	*Six needles.*

10. *Gu* refers to "hats, buttons," &c.

Tatjing gu chigwau,	*Seven hats.*
Gūlang gu stanshanga,	*Eight buttons.*
Hāku gu klālthswansingu,	*Nine halibut.*
Cīdā guu ālālth,	*Ten mothers of halibut.*
Dāla hinawē gu lth'ūnilth,	*Three half dollars.*
Chīn yillā gu stung,	*Two dry salmon.*

11. *Tu* refers to "spoons and fans."

Yhitou tu klālth,	*Ten fans.*	Stlagwal tu klālē stung,	*Twenty spoons.*

12. *Ā* refers to "villages, plates," &c.

Kēlthka ā stung,	*Two plates.*
Lanna ā klēlth,	*Five villages.*
Kūwē ā lth'ūnilth,	*Three doors.*
Basketgē ā chigwau,	*Seven baskets.*
Hetlista ā stanshanga,	*Eight pieces of lumber.*
Hēadla ā klālth,	*Ten buckets.*

13. *Sis* refers to "boxes, shirts, &c.

Hōt sis swaunshung,	*One box.*
Kōdets sis stung,	*Two coats.*
Sistlang sis lth'ūnilth,	*Three pans.*
Kōdets kātli sis stanshung,	*Four shirts.*
Hankwute sis klēlth,	*Five kettles.*
Zanōdan sis lthūunilth,	*Six stoves.*

14. *Tla* refers to "breeches, stockings," &c.

Kwunē tla chigwau,	*Seven pair of breeches.*
Tladinījingē tla stanshanga,	*Eight pictures.*
Statilthdou tla klālthswansingu,	*Nine stockings.*
Yātz tlinganda tla klālth,	*Ten pieces of iron.*
Kūtiljou tla stung,	*Two axes.*
Kwul tla klēlth,	*Five plugs of tobacco.*

15, *Lth'ka* refers to "beds, tables," &c.

Tidan lth'ka stanshung,	*Four beds.*
Tablegē lth'ka chigwau,	*Seven tables.*
Zanoē lth'ka klālth,	*Ten pieces of fire wood.*
Aulthkaaungwē lth'ka swaunshung,	*One chair.*
Gatou lth'ka stung,	*Two forks.*
Kāsotouho kūasi lth'ka lthūunilth,	*Six candlesticks.*

16. A few irregular prefixes and adjectives are :

Tokwuntlo ku klēlth,	*Five matches.*
Stai kiskwan,	*One hand*
Nē tiskwan,	*One house.*
Churchnigē tiskwan,	*Whole church.*
Schoolnigē tiskwan,	*Whole school.*
Tlikalthdou kasku,	*Whole steel.*
Stlē chiskwan,	*One hand.*
Kalk kiskwan,	*One bottle.*

17. There are also a few irregular comparative and superlative degrees, as :

Kwaun	*Furseal.*	Hōt,	*Box.*
Kwaun glāila,	*Medium size furseal.*	Hōt siskōna,	*Large box.*
Kwaun hutsu,	*Small furseal.*	Hōt saisilla,	*Medium size box.*
Kwaun sūtsu,	*Smallest furseal.*	Hōt hutsu,	*Small box.*
Kwaun tlakōna,	*Large furseal.*	Hōt sūtsu,	*Smallest box.*
Ou iskōna ?	*Is it larger ?*		
Tlī gu yesgāga ?	*Is it bigger ?*		
Tlīī il tlagāga ?	*Is he bigger ?*		

Examples of Adjectives.

Nung ītlinga lā il īching,	*He is a good man.*
Anung chadas kutungā gung,	*The woman is wise.*
Nung ītlinga lā yuan dung īching,	*You are a very good man.*
Adshi kōdets olthilth gung,	*This coat is green.*
Ltha telgu il lāgung,	*He is better than they.*
Dī telgu il īching,	*He is stronger than.*

Dung telgu il zūi *jin*ḡung,	*He is better than you.*
Adshi wautelgu lā sitlthlīgung,	*This is the best.*
Adshi wauhangast agwi ēdung,	*This is the least.*
Laou dāunga sitlthlīgung,	*He is the worst.*
Anung hāhutsu kutungā sitlthlīgung,	*This is the wisest plan.*
Ītil kwutungēsti yuan gung,	*We are very sorry.*
Tada saasgud di stigun,	*I was sick one day.*
Nē ti swaunshung lth daang,	*I have four horses.*
Gūdjou sa klēlth lth dakgun,	*I bought five drums.*
Dālā ki stung dung ga lth istāshang	*I shall give you two dollars.*
Sistlang sis klēlth ga di istatlang,	*I want five kettles.*
Kwaun glaiila di ga lth ista,	*Give me the medium sized furseal.*

VII. ADVERBS.

1. *Adverbs of Time.*

Itan,	*Then.*	Wēata,	*Now.*	Awolth,	*Formerly.*
Silīd,	*After.*	Wadla,	*Afterwards.*	Kwai amzawan,	*Presently.*
Houītang,	*Immediately.*	Itanan,	*Soon.*	Ēlthki,	*Already.*
Kwunast,	*Before.*	Aiata,	*To-day.*	Adātlth,	*Yesterday.*
Adātlthstlo,	*To-morrow.*	Tlīstluan,	*Betimes.*	Tlaglu,	*Ago.*
Gust,	*Next.*				

Examples.

Dung lth kingasēs silīd lth kaiitshang,	*I shall go after I see you.*
Wēata dī sti yūanḡung,	*I am now very ill.*
Awolth dī dāungang dī tlou wēata laḡung,	*Formerly I was wicked, but now I am good.*
Dī talthtlāt tlāgang itan dung ta lth tlātsang,	*Help me first, then I will assist you.*
Houītang lth kā, waigen wadla dī dung kingasang,	*Go immediately, and you will see me afterwards.*
Adātlth lā lth kinḡuni, aiata tlou kum lā lth kingānḡun, adātlthstlo houshen lā lth kingasang,	*I saw him yesterday, but I have not seen him to-day. To-morrow I shall see him again.*
Itanan lth lthāangwilashang,	*I shall soon go to work.*
Tlaglu agwi Jesus ītil hagunan kwōtalang,	*Jesus died for our sins a long time ago.*
Laou kātlāgang kwunast dī kwutungē lāḡang,	*I was happy before he came.*
Kwai amzawan kin dung ga lth istāshang,	*I will give it to you presently.*
Tlīstluan il tagwiāgunḡung,	*Betimes he is strong.*

2. *Duration of Time.*

Edgū,	*Always.*	Swaunung,	*Ever.*	Kum tliku,	*Never.*
Tlāā,	*Long.*	Hanskīt,	*Continually.*	Houān,	*Awhile.*

Examples.

Waīkingān il edgū gung,	*He is always the same.*
Laou hēninga swaunung shang,	*He will live for ever.*
Kum tliku ādlun il katsa tlingē kāng gaangung,	*He can never come here.*
Dī kwōsan hanskitung,	*I am coughing continually.*
Houān singelthkang talung gūshūgundang,	*While we pray.*
Tlāā il stīgun,	*He has been a long time ill.*

3. *Repetition of Time.*

Gīī,	*Often.*	Kinhutla,	*Seldom.*	Houshen,	*Again.*
Giakut,	*Sometimes.*	Gungung,	*Generally.*	Houtlagīī,	*Anew*
Lthwoiagīī,	*Afresh.*	Sinstla,	*Mostly.*		

Examples.

Victoria tligē ā lth kaiit gīī gung,	*I often go to Victoria.*
Tlaigu tligē ā lth kaiit hutlang,	*I seldom go to Skidegate.*
Houshen dung kāngē da dī kwudungung,	*I wish to see you again.*
Giakut dī kwutungē dāungang,	*Sometimes my heart is wicked.*
Lā lth kingīī gungung,	*I generally see him.*
Kōdets houtlagīī gung,	*The coat is always new.*
Īl saai lthwoiagīī gun,	*His cheek has broken out afresh.*
Dī stis sinstla gīīgung,	*I am mostly unwell.*

4. *Adverbs of Place (rest in a place).*

Waudlun,	*There.*	Shā,	*Above.*	Kiāgūst,	*Without.*
Ādlun,	*Here.*	Hēt,	*Below.*	Nagūst,	*Within.*
Tlīīdan,	*Everywhere.*	Ā,	*In.*	Kum tlīīdan,	*Nowhere.*
Kwunast,	*Before.*	Kiā,	*Out.*	Hantlā,	*In front of.*
Wauā,	*Yonder.*	Glā,	*Behind.*		

Examples.

Hantlā il kouwang,	*He sits in front of me.*
Waudlun il giangung,	*He is standing there.*
Shā stāhā il kātlātālang,	*He came from above.*
Kum tlīīdan kāng gaangung,	*It is nowhere.*
Adlun il kouwang,	*He sits here.*
Hēt gu il īching,	*He is below.*
Dī nagūst kin dāunga īching,	*There is wickedness within me.*
Lth hāada tlīīdan īching,	*The people are everywhere.*
Kiāgūst il gians lth kingung,	*I see him standing without.*
Ītil glā il īching,	*He is behind us.*

Dī kwunast il kāgung,	*He walks before me.*
Adshā nē ā il īching,	*He is in this house.*
Kiā lth is,	*Go out.*
Wauā il īching,	*Yonder he is.*

5. *Motion to or from a Place.*

Āā	*To.*	Wadshgwi,	*Away.*	Adshistāha,	*Hence.*
Ai,	*Into.*	Althgwīk,	*Hither.*	Wadshistāha,	*Thence.*
Ga,	*Unto.*	Washt,	*Off.*	Stāhā,	*Forth.*
Oudlun,	*Thither.*	Sīkgang,	*Upward.*	Hetgang,	*Downward.*
Jinga,	*Far.*	Dūulthkang,	*Sidewards.*	Addūlthkang,	*Around.*
Althla,	*Wide.*	Āanān,	*Near.*	Oteltbkang,	*Backwards.*
		Kunungwīk,		*Forward.*	

Examples.

Waddanigē āā il kāgung,	*He walks to the store.*
Wadshgwi il kaiitang,	*He goes away.*
Stāhā il īchin,	*He has gone forth.*
Kōdetsē washt lth istang,	*I take off my coat.*
Churchnigē ai il katsagun,	*He has come into the church.*
Adshi dung ga lth istang,	*I bequeath this unto you.*
Adshistāha dī lāsang,	*Hence I shall be good.*
Wadshistāha il kātlāsang,	*" From thence he will come."*
Althgwīk lth is,	*Come hither.*
Oudlun gu is,	*(Go) thither.*
Sīkgang il kātlang,	*He climbs upwards.*
Hetgang il kats jāgung,	*He goes with his head downwards.*
Tlaou addūlthkang kingung,	*I look around.*
Tlaou otelthkang kāgung,	*I walk backwards.*
Laou dūulthkang kāgung,	*He walks sidewards.*
Talung kunungwīk istalgung,	*We walk forward.*
Laou tliga jinga gu il īching,	*He is in a far country.*
Dī kwulth āanān il kouwang,	*He sits near to me.*
Hetgwaugē kūwē althlā gung,	*The gates of hell are wide.*

6. *Adverbs of Quality Denoting Manner.*

Hin,	*Thus.*	Kwutungē kladskas,	*Boldly.*	Kladska,	*Strongly.*
Hu,	*So*	Kutangtlidzūdi,	*Wisely.*	Lāgung,	*Well.*
Kwunan,	*Firmly.*	Houītang,	*Quickly.*		

Examples.

Hin lth shūgung,	*Thus I say.*
Kwutungē kladska alth il hāēlthtagun,	*Boldly he fought.*
Kaiitē da dī kwudangē kladskā gung,	*I strongly desire to go.*
Laou lāgung,	*He is well.*
Laou kutangtlidzūdang,	*He acts wisely.*
Houītang lth ītīl tatlāt,	*Help us quickly.*
Kwunan il gidsgildagun,	*He held it firmly.*

7. *Adverbs of Degree.*

Yūan,	*Very.*	Talgung,	*Nearly.*	Sitlthlīgung,	*Quite.*
Telgu,	*More.*	Yenkien,	*Exceedingly.*	Wautelgu agwi,	*Most.*
Hēlōtāl,	*Scarcely.*	Kwudungalthan,	*Altogether.*	Wauhangast ed,	*The less.*
Wautelga ed,	*The more.*	Gūshāg,	*Almost.*	Tlan swaunan,	*Only.*
		Telgu agwi lās,	*Eminently.*		

Examples.

Laou lā yūan gung,	*He is very good.*
Laou lāgelth talgung,	*He is nearly well.*
Gūshāg dī il tiaskaḡun,	*He almost killed me.*
Skūshīt hēlōtal gung,	*There are scarcely any potatoes.*
Tlan Shālānā swaunan tagwiāḡung,	*The Lord only is mighty.*
Laou tagwia sitlthlīgung,	*He is quite strong again.*
Ādlun kwudungalthan talung īching,	*We are altogether here.*
Wautelgu ĭtil il kwōyādung,	*He loves us more.*
Shālāna wautelgu agwi lāḡung,	*The Lord is most holy.*
Wautelga ed dī ga il istaḡun.	*He gave me the more.*
Wauhangast ga ed lā ga il istaḡun,	*He gave him the less.*
Yenkien dī kintlingāḡung,	*I am exceedingly rich.*
Laou ltha telgu agwi tāḡung,	*He is eminently worthy.*

8. *Adverbs of Quantity Denoting Measure.*

Kwun,	*Much.*	Klingān,	*Little.*	Daiadung,	*Entirely.*
Titch,	*Somewhat.*	Īdung,	*Enough.*	Hīnawē,	*Half.*
Tatilzu,	*Partly.*				

Examples.

Kwun tlakwīda dī ga il istaḡun,	*He gave me much trouble.*
Klingān dī lāgelgung,	*I am a little better.*
Stā īdung,	*It is enough.*
Il tītch tagwiāḡung,	*He is somewhat better.*
Lth hāada tatilzu ōstān,	*The people are partly gone.*
Laou lāgelth daiadung,	*He is entirely well.*
Hinawē dī ga il istaḡun,	*He gave me half.*

9. *Adverbs Denoting Number.*

Sa swaunshunḡlu,	*Once.*	Otgwau,	*Finally.*	Tlāgang,	*Firstly.*
Waugud lth'ūnilth,	*Threefold.*	Wadla,	*Secondly.*	Stunḡung,	*Twice.*
Waugud stung,	*Twofold.*	Otgwau agwi,	*Lastly.*		

10. *Adverbs of Mood.*

A. Affirmation.

Āng,	*Yes.*	Yenslē,	*Truly.*	Kwaulthangan,	*Certainly.*
Āhu ōh ēh,	*Surely.*				

Examples.

Paul gu dung kāngā ?	*Did you see Paul ?*	Āng,	*Yes*
Yenstē il kwutungē unga stīlthtang,		*Truly he repents.*	
Kwaulthangan dung shūgung,		*You certainly said so.*	
Su tada yūan us ?	*Is it very cold ?*	Ēh Ōh,	*Surely the cold is great.*
Dahou gu kāiit us ?	*Are you going ?*	Ōh,	*I am surely going.*

B. Negation.

Kāhano,	*No.*	Kum,	*Not.*	Chikiang,	*By no means.*
Kum tliku klingē kāng gaangung,		*Not at all.*			

Examples.

James gu dung kāngā ?	*Did you see James ?*	Kāhano,	*No.*
Kum adshi istiē an dī tagwiāgung,		*I am not able to do this.*	
Kaiītiē ā dī chikiang,		*I can by no means go.*	
Kum tliku īl kāūt klingē kāng gaangung,		*He is not able to go.*	

C. Adverbs Denoting Doubt and Probability.

Althlingung,	*Possibly.*	Aia,	*Probably.*	Asingung,	*Perchance,*
Aiakum,	*Improbably.*	Hangung,	*Likely.*		*Perhaps.*

Examples.

Bishop lth kingasā althlingung,	*I may possibly see the Bishop.*
Aiat gu zanōtluwē kātla us ?	*Will the steamer come to-day ?*
	Aia, *Probably.*
Kīgāni hāade tlu istlā asingung,	*Perchance the Kegani people may come.*
James Killasu is hangung,	*James is likely to be in Fort Simpson.*

11. *Interrogative Adverbs :*

Gūshu hagunan,	*Wherefore.*	Kīshindo,	*When.*	Kitlano,	*Where.*
Kashintlou,	*Why.*	Tlīstluan,	*When.*		

Examples.

Kashintlou kum lā dung kingāng ūdjang ?	*Why did you not see him ?*
Kīshindo Victoria tligē stāhā dalung istlāgun ?	*When did you come from Victoria ?*
Gūsh hagunan chā unga dung dāngun ?	*Wherefore* or *why did you put away your wife,* i.e., *why are you divorced or separated ?*
Kitlano gu talung istiēdasang ?	*Where shall we go ?*

12. *Adverbs Which Imply Rest in a Place.*

Sīk, *Up.* Inku, *On.* Telga, *Over.* Hetit, *Under.* Hēt, *Down.* Kalthgūd, *Through.*

Examples.

Sīk il kātlaiang,	*He went up.*
Kōgīnē tablegē inku īching,	*The book is on the table.*
Skatlangwē kwulthkadazi telga lth kālāng,	*I threw the cup over the fence.*
Tablegē hetit ltha tlūadanḡung,	*They sit under the table.*
Kit unga swaunshungs hēt ga il istaiang,	*He sent down his son.*
Nē kalthgūd il kouunḡung,	*He wanders through the house.*

VIII. PREPOSITIONS.

Ā, *In.* Gūā *or* Gwau, *At.* Kingān, *According to.* Ga, *Unto.*
Āā (sometimes contracted to Ā), *To.* Kalthgwīd, *Throughout.* Stāhā, *From.*
Inku, *On.* Washt, *Of.* Alth, *With.* An, *For.*
Āaṇān, *Near.* Shū, *Among.* Hetit, *Under.* Kwunast, *Before.*
Tlā, *Behind.* Hagunan, *On account of.* Ādang, *Except.*
Kalthkāan, *Instead of.* Āada, *Between.*

Examples :

Nē ā lth ista,	*Put it in the house.*
London āā lth kāiitshang,	*I shall go to London.*
Kīgāni hāadē lā yūan gung Masset tligē gwau,	*The Kegani people are very good at Masset.*
Tliku il shūs kingān lth wauḡung,	*I act according to his instructions.*
Sa dāungas gē stāhā lth ītil kaginda,	*Deliver us from evil persons.*
Adshi dung ga lth istāshang,	*I shall give this to or unto you.*
Aulthkaaungwē inku lth kāsotouho ista,	*Put the lamp on the chair.*
James isken John ishin āada il kouwang,	*He sits between James and John.*
Dung alth dī kwutungē lāḡung,	*I am pleased with you.*
Dī an dung lthāangwilaḡunḡung,	*You are working for me.*
Lā kwulth āanān dung īching,	*You are near him.*
Lth hāada shū il gianḡung,	*He stands among the people.*
Jesus Christ kalthgwid ītil Shālānā,	*Through Jesus Christ our Lord.*
Aulthkaaungwē hetit hai īching,	*There is a dog under the seat.*
Dī kwunast il isgīī gung,	*He is always before me.*
Dalung tlā lth kāshang,	*I shall walk behind you.*
Jesus ītil hagunan kwōtalang,	*Jesus on our account* (or *for our sake*) *died.*
Shānungetlagidas ītil alth is ādang kum ītil tagwiā tlingān ḡung,	*Except God be with us we are powerless.*
Dī kalthkāan il hāēlthtang,	*He fights instead of me* (or *in my place.*)

IX. CONJUNCTIONS.

1. *Copulatives.*

Waigen,	*And.*	Tlīstluan,	*When.*	Skeu,	*If.*	Itan,	*Then.*
Althlā,	*Because.*	Isken,	*And.*	Ishin,	*Also.*	Wou,	*That.*

Examples.

James isken John ishin kwutkingānu ēdung,	*James and John are alike.*
Tlīstluan kin wautliwan dung ēlthkīdastlo althkwi lth is,	*You can come when you have finished everything.*
Dī dalung kwōyādasken kingwōguns tuman dī na lth kingo,	*If ye love me, keep my commandments.*
Lā lth kwōyādo ītil il kwōyāda tlāgangāni althlā,	*Love him because he first loved us.*
Shīgili waigen skūshīt dung ga lth istāgun,	*I gave you bread and potatoes.*
Lā an lth lthāangwil tlāgang itan dung ga il giasouasang,	*Work for him first, then he will pay you.*
Kitlano wou kōgīna dung ga istāguni īching?	*Where is the book that I gave you?*

2. *Disjunctives*

Tlou,	*But.*	Skenan,	*Although.*	Tlau swaunan,	*Only.*
Houshen,	*Again.*	Ādang,	*Except.*	Wunisgwau,	*Or.*
Ishin,	*Also.*	Anisgwau,	*Either.*		

Examples.

James kutungāgung dī tlou kum kutungāngung,	*James is wise but I am not wise.*
Itil dāunga skenan shānungetlagidas ītīl kwōyādung,	*Although we are wicked, yet God loves us.*
Tlan Peter swaunan tagwiāgung,	*Peter only is strong.*
Houshen dung lth kingasang,	*I shall see you again.*
Kin lā lā ga lth ista kwangun kōgīna las ishin,	*I gave him many good things and a good book also.*
Kum houshen adlun lth kātlāngshang lth kaiitē dung gwūlasken,	*I won't come here again if you will let me go.*
Shānungetlagidas ādang kum ītil swaun tagwiāngung,	*No one is strong except God.*

X. INTERJECTIONS.

Ānāniā or *Āchadiā!*	Oh dear! Used only when suffering intensely.
Āni. O. Gla!	Splendid! How beautiful! How pretty!
Ēā yhā or *Hīā Hīā!*	Denote surprise at the great quantity.
Ka!	An expression of disgust.
Ōlang!	Stop it! *Dūī!* For shame, Fie! (Used by females only.)
Maik!	Fie. Shame! (Used by males only). *Ēyhā.* Shame!
Glanā!	Come, Come! *Kwaiking!* Lo! *Kwoking!* Behold!
Chū kwan yūan!	Oh! how many.

Hii delgu yūanǵung !	Oh ! how it rains *or* Oh ! the big rain !
Kungā !	Oh ! how dirty ! Refers to the body only.
Hī !	Oh ! how dirty ! Refers to clothes only.
Yha !	An expression of disappointment when anything does not turn out as expected.
Ū !	O !
Houā ?	Expression of delight.
K'o !	An expression of disgust.

XI. VERBS.

Verbs agree with their subject both in number and person, and if two or more subjects are connected by "and" the verb is in the plural.

If one pronoun is affirmative and the other the negative, the verb agrees with the affirmative pronoun.

1. *Voice.*

If we consider an action on the one hand as expressing what anything does, or on the other hand as expressing what is done to it, we indicate these differences by the Active and Passive Voices, as :

Active,	Tlaou istang,	*I take.*
Passive,	Dī istīāǵung,	*I am taken.*

2. *Mood.*

An action or state may be asserted of a subject in different modes, as an actual reality, or as a possibility, or as a command. The forms appropriate to each are called the modes or moods of a verb.

A. Indicative Mood.

The simple assertion that an action is done, has been, or will be done is put in the indicative mood. Thus this mood simply affirms or denies, as :

Tlaou hāēlthtang,	*I fight.*
Kum lth kaiitāngshang,	*I will not go.*
Tlaou skadadang,	*I teach.*
Kum laou kātliyildungāngūn,	*He was not angry.*
Talung nīlgung,	*We drink.*
Talung kwōyādung,	*We love.*

B. Subjunctive Mood.

If uncertainty or dependence on something else is expressed we use the Subjunctive Mood. Verbs in this mood are preceded by a conjunction such as : *in order that, that, if,* &c. They are also preceded or followed by another verb not in the subjunctive.

Examples.

Jesus kwōtālang ītil il kagindiēan,	*Jesus died in order that he may save us.*
Dī ta dung tlātstlo dung ta lth tlātasang,	*If you help me I will help you.*
Kum dalung yetānstlo dalung gūashang,	*If you do not believe, you will be lost.*
Dung kil kingān lth waugung di kagunēan,	*I obey you in order that I may be saved.*
Tlaou kaiitstlo,	*If I go.*
Il kil lth yetiēan,	*That I may believe him.*

C. Conditional Mood.

This implies the possibility of an action under a certain condition expressed by another verb in the subjunctive.

Examples.

Tlaou kwōyādahangung,	*I may love.*
Dung kaiitsken lth kaiitēan,	*I may go if you go.*
Dī alth dung kwutungē lāsahangung,	*You may be happy with me.*
Dī kwōtalstlo dung kwutungēsti althlingung,	*Perhaps you will be should I die.*
Tlaou kaiitstlo dung ishin kaiitasahangung,	*If I go you may also go.*

D. Imperative Mood.

If the assertion is in the form of a command we use the Imperative Mood.

Examples.

Kaiitla,	*Go.*	Istalthā,	*Take it.*
Dī tlā lth ishalo,	*Follow me.*	Hansta lth shū,	*Confess.*
Althkwī lth kā,	*Come here.*	Sing lā ā lth killā,	*Thank him.*

E. Conjunctive Mood.

The pure conjunctive is rendered in English with auxiliary verbs for signs; generally *would, should* or *might.* The Conjunctive Mood has wo general uses:

Pure, or not subordinate to another verb.

2 Subordinate to another verb.

The conjunctive is called pure when it is in the predication of a principal sentence. The Conjunctive Mood has sometimes a subjunctive in subordination to it. I have divided the Conjunctive Mood into two parts:

1. Pure Conjunctive Mood. 2. Conditional Conjunctive Mood.

Dung lth kwōyādiē lāgīni,	*I should have loved you.*
Dung stistlo dung lth kwōyādātlingāgun,	*If you were good, I would love you.*
Dung stistlo dung ta lth tlāēdēan,	*If you were ill, I might assist you.*

F. We have also a Causative Form equalling in force the Hiphil in the Hebrew language:

Tlaou kwōyādāhalgung,	*I cause to love.*
Tlaou istīēdhalgung,	*I cause to go.*
Tlaou tlitiēhalgung,	*I cause to kill.*

G. There is a Commandative Form in the Haida language, but it is not frequently used:

Tlaou kil kwōyādung,	*I command to love.*
Tlaou kil tlūadang,	*I command to sit down.*
Tlaou kil kaiitang,	*I command to go.*

H. The Intentional Form signifies what the speaker intends to do as:

Tlaou kaiitungkasang,	*I am about to go.*
Tlaou kwōyādāungkasang,	*I am about to love.*
Tlaou hāēlthtāungkasang,	*I am about to fight.*

I There is also another form which is used to denote a wish or desire:

Di stigē da kwudunūng,	*I wish to be ill.*
Tlaou kāugē da kwudunūng,	*I desire to see.*
Tlaou kwōyādīē du kwudunūng,	*I wish to love.*

J. *Participles.*

Besides the four moods we have in Haida three participles. The participles describe both what is imperfect and what is complete. The three forms are the present, the perfect, and the present progressive.

Present.		Perfect.	
Lthāangwilas,	*Working.*	Lthāangwilgīni,	*Having worked.*
Kwuduns,	*Wishing.*	Kwudunūīni,	*Having wished.*
Kwōyadas,	*Loving.*	Kwōyādaūīni,	*Having loved.*
Telgakings,	*Hating.*	Telgakinūīni,	*Having hated.*
Kings,	*Seeing.*	Kinūīni,	*Having seen.*
Hāēlthtas,	*Fighting.*	Hāēlthtaūīni,	*Having fought.*

Present Progressive.

Lthaangwilgīgini,	*Having been working.*
Kwudunūīgini,	*Having been wishing.*
Kwōyādaūīgini,	*Having been loving.*
Telgakinūīgini,	*Having been hating.*
Kinūīgini,	*Having been seeing.*
Hāēlthtaūīgini,	*Having been fighting.*

3. *Tenses.*

Tense is from the Latin *tempus* and signifies time. If we take into consideration the time in which an action is performed and express it, we

must employ what are called "Tenses." Tenses mark an action as being either Present, Past or Future, as:

Tlaou kwōyādung,	*I love.*
Tlaou kwōyādaguni,	*I loved.*
Tlaou kwōyādāsang,	*I will love.*

We have also two Historic Tenses which are used only when relating something that was not done in the presence of the audience.

Examples.

Kin tliskwudas il istāgangang hagunan il kwutungēstigang,	*He was sorry for the wrong he had done.*
Jesus ītil hagunan kwotālang,	*Jesus died for us.*
Ītīl il kwōyādagangang,	*He had loved us.*
Adshi tligē dāungangang,	*This world had been wicked.*
Ltha il kāngang,	*He saw them.*
Herod ltha hahudila tlitagangang,	*Herod killed the children.*

4. *Number and Person.*

There are two numbers in every tense and mood; they are called the singular and the plural. Each number has three persons; the first is the person who speaks; the second is the person spoken to, and the third is the person spoken of. The subjects of verbs are always nouns and pronouns. They form separate words and always precede the verb.

5. *Conjugation of Verbs.*

A. Conjugation of the Auxiliary Verb—To be.

Indicative Mood.

Present Tense.

	Tlaou īching,	*I am.*
	Dahou īching,	*Thou art.*
	Laou īching,	*He is.*
	Talung īching,	*We are.*
	Dalung īching,	*Ye are.*
	Ltha īching,	*They are.*
If a few:	Laou iswang,	*They are.*

Past Tense.

	Tlaou idjang,	*I was.*
	Dahou idjang,	*Thou wast.*
	Laou idjang,	*He was.*
	Talung idjang,	*We were.*
	Dalung idjang,	*Ye were.*
	Ltha idjang,	*They were.*
If under ten:	Laou isouwang,	*They were.*

Future Tense.

	Tlaou isisang,	*I shall be.*
	Dahou isisang,	*Thou wilt be.*
	Laou isisang,	*He will be.*
	Talung isisang,	*We shall be.*
	Dalung isisang,	*Ye shall be.*
	Ltha isisang,	*They shall be.*
If under ten:	Laou isiwausang,	*They shall be.*

IMPERATIVE MOOD.

Is,	*Be thou.*
Laou isadzing,	*Let him be.*
Isso,	*Be ye.*
Ltha isadzing,	*Let them be.*

CONJUNCTIVE MOOD.

Present Tense.

	Tlaou ishangung,	*I may be.*
	Dahou ishangung,	*Thou mayst be.*
	Laou ishangung,	*He may be.*
	Talung ishangung,	*We may be.*
	Dalung ishangung,	*Ye may be.*
	Ltha ishangung,	*They may be.*
If under ten:	Laou isouhangung,	*They may be.*

OPTATIVE MOOD.

Present Tense.

	Tlaou istlingāgung,	*I might be.*
	Dahou istlingāgung,	*Thou mightest be.*
	Laou istlingāgung,	*He might be.*
	Talung istlingāgung,	*We might be.*
	Dalung istlingāgung,	*Ye might be.*
	Ltha istlingāgung,	*They might be.*
If under ten:	Laou istlingāgung,	*They might be.*

Future Tense.

	Tlaou isungkashang,	*I might be.*
	Dahou isungkashang,	*Thou mighest be.*
	Laou isungkashang,	*He might be.*
	Talung isungkashan,	*We might be.*
	Dalung isungkashang,	*Ye might be.*
	Ltha isungkashang,	*They might be.*
If under ten:	Laou isungkawaushang,	*They might be.*

about to be.

INFINITIVE MOOD.

Present Tense,	Isgē,	*To be.*
Future Tense,	Isungkasasgē,	*To be about to be.*

PARTICIPLES.

Present Tense,	Isas,	*Being.*
Future Tense,	Isungkasas,	*About to be.*

Note.—Before the regular verbs are commenced it is necessary to learn the auxiliary verb, as parts of it are used in the conjugation of all the other verbs.

B. The principal tenses of the regular verbs may be thus arranged :

Present	Tlaou kwōyādung,	*I love.*
	Tlaou kwōyādaḡunḡung,	*I am loving.*
	Tlaou kwōyādaḡīni,	*I have loved.*
	Tlaou kwōyādaungkasang,	*I am about to love.*
Past	Tlaou kwōyādaḡuni,	*I loved.*
	Tlaou kwōyādaḡīḡīni,	*I was loving.*
	Tlaou kwōyādaḡīḡunḡwan,	*I had loved.*
	Tlaou kwōyādaungkaḡīḡīni.	*I was about to love.*
Future.	Tlaou kwōyādāsang.	*I shall love.*
	Tlaou kwōyādaḡungsang.	*I shall be loving.*
	Tlaou kwōyādangsang.	*I shall have loved.*
	Tlaou kwōyādaḡīungkasang.	*I shall have been loving.*

The present tense is used to express a state begun in past time and now continuing, Some presents have regularly a perfect tense as *Tlaou kātlāḡung*, I am come.

The past is used as the Aorist in Greek, and is used in conversation of something recently said or done.

The future always refers to something immediately to be done or about to be done. Sometimes it is used of a future action and represents it as continuing to be.

I have used the following pronouns :

Tlaou,	*I.*	Talung,	*We.*
Dahou,	*Thou.*	Dalung,	*Ye.*
Laou,	*He.*	Ltha,	*They.*

If only a few persons, places, or articles be referred to, *Laou* is used as the third person plural and the distinction between the third person singular and the third person plural is shown by the termination of the verb for the third person plural.

The following pronouns also may be used :

Lth,	*I.*	Ītil,	*We.*
Dung,	*Thou.*	Dalung,	*Ye.*
Il,	*He.*	Ltha,	*They.*

Il is sometimes used for the third person plural, if only a few persons, places, or articles be referred to, and the difference between the third person singular and the third person plural is shown by the termination of the verb for the third person plural.

We thus see that *lth*, *dung*, and *il* are interchangeable with *tlaou*, *dahou* and *laou*, and either may correctly and at any time be used.

C. Conjugation of a Regular Verb.

Conjugation I.—Kwōyāda, To love.

Indicative Mood.

Present Tense.

Tlaou kwōyādung,	*I love.*
Dahou "	*Thou lovest.*
Laou "	*He loves.*
Talung "	*We love.*
Dalung "	*Ye love.*
Ltha "	*They love.*
Laou kwōyādawang,	*They love.*

Present Imperfect Tense.

Tlaou kwōyādaḡunḡung,	*I am*	*loving.*
Dahou "	*Thou art*	
Laou "	*He is*	
Talung "	*We are*	
Dalung "	*Ye are*	
Ltha "	*They are*	
Laou kwōyādaḡunḡung,	*They are*	

Past Tense.

Tlaou kwōyādaḡuni,	*I loved.*
Dahou "	*Thou lovedest.*
Laou "	*He loved.*
Talung "	*We loved.*
Dalung "	*Ye loved.*
Ltha "	*They loved.*
Laou kwōyādwoḡuni,	*They loved.*

Past Imperfect Tense.

Tlaou kwōyādaḡīgīni,	*I was*	*loving.*
Dahou "	*Thou wast*	
Laou "	*He was*	
Talung "	*We were*	
Dalung "	*Ye were*	
Ltha "	*They were*	
Laou "	*They were*	

Perfect Tense.

Tlaou kwōyādaḡīni,	*I have*	*loved.*
Dahou "	*Thou hast*	
Laou "	*He has*	
Talung "	*We have*	
Dalung "	*Ye have*	
Ltha "	*They have*	
Laou kwōyādwoḡīni,	*They have*	

Perfect Progressive.

Tlaou kwōyādaḡun,	*I have*	*been loving.*
Dahou "	*Thou hast*	
Laou "	*He has*	
Talung "	*We have*	
Dalung "	*Ye have*	
Ltha "	*They have*	
Laou kwōyādwoḡun,	*They have*	

Pluperfect Tense.

Tlaou kwōyādaḡīgunḡwau,	*I had*	*loved.*
Dahou "	*Thou hadst*	
Laou "	*He had*	
Talung "	*We had*	
Dalung "	*Ye had*	
Ltha "	*They had*	
Laou kwōyādwoḡīgunḡwau,	*They had*	

Pluperfect Progressive Tense.

Tlaou kwōyādaḡīḡunḡung,	*I had*	*been loving.*
Laou "	*He had*	
Dahou "	*Thou hadst*	
Talung "	*We had*	
Dalung "	*Ye had*	
Ltha "	*They had*	
Laou kwōyādwoḡīḡunḡung,	*They had*	

Future Tense.

Tlaou kwōyādāsang,	*I shall*	*love.*
Dahou "	*Thou wilt*	
Laou "	*He will*	
Talung "	*We shall*	
Dalung "	*Ye will*	
Ltha "	*They will*	
Laou kwōyādawāsang,	*They will*	

Future Imperfect Tense.

Tlaou kwōyādaḡungsang,	*I shall*	*be loving.*
Dahou "	*Thou wilt*	
Laou "	*He will*	
Talung "	*We shall*	
Dalung "	*Ye will*	
Ltha "	*They will*	
Laou kwōyādaḡungwāsang,	*They will*	

Future Perfect.

Tlaou kwōyādangsang,	*I shall*	*have loved.*
Dahou "	*Thou wilt*	
Laou "	*He will*	
Talung "	*We shall*	
Dalung "	*Ye will*	
Ltha "	*They will*	
Laou "	*They will*	

Future Perfect Progressive

Tlaou kwōyādagīgungsang,	*I shall*	*have been loving.*
Dahou "	*Thou wilt*	
Laou "	*He will*	
Talung "	*We shall*	
Dalung "	*Ye will*	
Ltha "	*They will*	
Laou kwōyādagīgungwāsang,	*They will*	

Intentional Form.

Present Tense.

Tlaou kwōyādaungkasang,	*I am*	*about to love.*
Dahou "	*Thou art*	
Laou "	*He is*	
Talung "	*We are*	
Dalung "	*Ye are*	
Ltha "	*They are*	
Laou kwōyādaungkawāsang,	*They are*	

Imperfect Tense.

Tlaou kwōyādatalgung,	*I am*	*going, or about to love.*
Dahou "	*Thou art*	
Laou "	*He is*	
Talung "	*We are*	
Dalung "	*Ye are*	
Ltha "	*They are*	
Laou kwōyādawotalgung,	*They are*	

Past Tense.

Tlaou kwōyādaungkagīgini,	*I was*	*about to love.*
Dahou "	*Thou wast*	
Laou "	*He was*	
Talung "	*We were*	
Dalung "	*Ye were*	
Ltha "	*They were*	
Laou kwōyādouungkagīgini,	*They were*	

Future Tense.

Tlaou kwōyādagīungkasang,	*I shall*	*be about to love.*
Dahou "	*Thou wilt*	
Laou "	*He will*	
Talung "	*We shall*	
Dalung "	*Ye will*	
Ltha "	*They will*	
Laou kwōyādagīungkawāsang,	*They will*	

Imperative Mood.

Present Tense.

Tlaou kwōyādadzing,	*Let me love.*
Kwōyādaltha,	*Love thou.*
Laou kwōyādadzing,	*Let him love.*
Talung kwōyādadzing,	*Let us love.*
Kwōyādūlthā,	*Love ye.*
Ltha kwōyādadzing,	*Let them love.*
Laou kwōyādwoadzing,	*Let them love.*

Present Progressive Tense.

Tlaou kwōyādaḡīadzing,	*Let me*	
Kwōyādaḡīltha,	*Let thou*	
Laou kwōyādaḡīadzing,	*Let him*	
Talung kwōyādaḡīadzing,	*Let us*	*be loving.*
Kwōyādaḡīūltha,	*Let ye*	
Ltha kwōyādaḡīadzing,	*Let them*	
Laou kwōyādwoḡīadzing,	*Let them*	

Historic Form.

Past Tense.

Tlaou kwōyādaiang,	*I loved.*
Dahou "	*Thou lovedst.*
Laou "	*He loved.*
Talung "	*We loved.*
Dalung "	*Ye loved.*
Ltha "	*They loved.*
Laou kwōyādawaiang,	*They loved.*

Pluperfect Tense..

Tlaou kwōyādaḡangang,	*I had loved.*
Dahou "	*Thou hadst loved.*
Laou "	*He had loved.*
Talung "	*We had loved.*
Dalung "	*Ye had loved.*
Ltha "	*They had loved.*
Laou kwōyādawaḡangang,	*They had loved.*

Causative Form.—Indicative Mood.

Present Tense.

Tlaou kwōyādahalgung,	*I cause*	
Dahou "	*Thou causest*	
Laou "	*He causes*	
Talung "	*We cause*	*to love.*
Dalung "	*Ye cause*	
Ltha "	*They cause*	
Laou kwōyādahalwang,	*They cause*	

Future Tense.

Tlaou kwōyādalthasang,	*I shall*	*cause to love.*
Dahou "	*Thou wilt*	
Laou "	*He will*	
Talung "	*We shall*	
Dalung "	*Ye will*	
Ltha "	*They will*	
Laou kwōyādalthawāsang.	*They will*	

Perfect Tense.

Tlaou kwōyādahālang,	*I caused*	*to love.*
Dahou "	*Thou causedst*	
Laou "	*He caused*	
Talung "	*We caused*	
Dalung "	*Ye caused*	
Ltha "	*They caused*	
Laou kwōyādouhālang,	*They caused*	

Pluperfect Tense.

Tlaou kwōyādahalgangang,	*I had*	*caused to love.*
Dahou "	*Thou hadst*	
Laou "	*He had*	
Talung "	*We had*	
Dalung "	*Ye had*	
Ltha "	*They had*	
Laou kwōyādahalwagangang,	*They had*	

SUBJUNCTIVE MOOD.

Present Tense.

Tlaou kwōyādahalastlo,	*If I*	*cause to love.*
Dahou "	*If thou*	
Laou "	*If he*	
Talung "	*If we*	
Dalung "	*If ye*	
Ltha "	*If they*	
Laou kwōyādahalwastlo,	*If they*	

Future Tense.

Tlaou kwōyādahalthsēstlo,	*If I shall*	*cause to love.*
Dahou "	*If thou wilt*	
Laou "	*If he will*	
Talung "	*If we shall*	
Dalung "	*If ye will*	
Ltha "	*If they will*	
Laou kwōyādahalthwasēstlo,	*If they will*	

Commandative Form.

Present Tense.

Tlaou	kil kwōyādung,	*I command*	*to love.*
Dahou	" "	*Thou commandest*	
Laou	" "	*He commands*	
Talung	" "	*We command*	
Dalung	" "	*Ye command*	
Ltha	" "	*They command*	
Laou	" kwōyādawang,	*They command*	

Past Tense.

Tlaou	kil kwōyādaḡuni,	*I commanded*	*to love.*
Dahou	" "	*Thou commandedst*	
Laou	" "	*He commanded*	
Talung	" "	*We commanded*	
Dalung	" "	*Ye commanded*	
Ltha	" "	*They commanded*	
Laou	" kwōyādwoḡuni,	*They commanded*	

Future Tense.

Tlaou	kil kwōyādāsang,	*I shall*	*command to love.*
Dahou	" "	*Thou will*	
Laou	" "	*He will*	
Talung	" "	*We shall*	
Dalung	" "	*Ye will*	
Ltha	" "	*They will*	
Laou	" kwōyādawāsang,	*They will*	

Desiderative Form.

Present Tense.

Tlaou	kwōyādiē da kwudunḡung,	*I wish*	*to love.*
Dahou	" " "	*Thou wished*	
Laou	" " "	*He wishes*	
Talung	" " "	*We wish*	
Dalung	" " "	*Ye wish*	
Ltha	" " "	*They wish*	
Laou	" " kwudungwang,	*They wish*	

Past Tense.

Tlaou	kwōyādiē da kwudunḡuni,	*I wished*	*to love.*
Dahou	" " "	*Thou wishedst*	
Laou	" " "	*He wished*	
Talung	" " "	*We wished*	
Dalung	" " "	*Ye wished*	
Ltha	" " "	*They wished*	
Laou	" " kwudungwuni,	*They wished*	

Future Tense.

Tlaou kwōyādiē da kwudungsang,	*I shall*	*wish to love.*
Dahou " " "	*Thou will*	
Laou " " "	*He will*	
Talung " " "	*We shall*	
Dalung " " "	*Ye will*	
Ltha " " "	*They will*	
Laou " " kwudungwāsang,	*They will*	

SUBJUNCTIVE MOOD.

Present Tense.

Tlaou kwōyādastlo,	*If I love*
Dahou "	*If thou lovest*
Laou "	*If he love*
Talung "	*If we love*
Dalung "	*If ye love*
Ltha "	*If they love*
Laou kwōyādawastlo,	*If they love.*

Present Imperfect Tense.

Tlaou kwōyādaḡungstlo,	*If I*	*be loving.*
Dahou "	*If thou*	
Laou "	*If he*	
Talung "	*If we*	
Dalung "	*If ye*	
Ltha "	*If they*	
Laou kwōyādaḡungwastlo,	*If they*	

Past Tense.

Tlaou kwōyādaiastlo,	*If I loved.*
Dahou "	*If thou lovedst.*
Laou "	*If he loved.*
Talung "	*If we loved.*
Dalung "	*If ye loved.*
Ltha "	*If they loved.*
Laou kwōyādouastlo,	*If they loved.*

Past Imperfect Tense.

Tlaou kwōyādaḡīḡanastlo,	*If I were*	*loving.*
Dahou "	*If thou wert*	
Laou "	*If he were*	
Talung "	*If we were*	
Dalung "	*If ye were*	
Ltha "	*If they were*	
Laou kwōyādaḡīwanastlo,	*If they were*	

Perfect Tense.

Tlaou kwōyādaḡīḡastlo,	*If I have*	
Dahou "	*If thou hast*	
Laou "	*If he has*	
Talung "	*If we have*	*loved.*
Dalung "	*If ye have*	
Ltha "	*If they have*	
Laou kwōyādaḡīouastlo,	*If they have*	

Perfect Progressive Tense.

Tlaou kwōyādaganastlo,	*If I have*	
Dahou "	*If thou hast*	
Laou "	*If he has*	
Talung "	*If we have*	*been loving.*
Dalung "	*If ye have*	
Ltha "	*If they have*	
Laou kwōyādwoḡanastlo,	*If they have*	

Pluperfect Tense.

Tlaou kwōyādaḡīḡasītlo.	*If I had*	
Dahou "	*If thou hadst*	
Laou "	*If he had*	
Talung "	*If we had*	*loved.*
Dalung "	*If ye had*	
Ltha "	*If they had*	
Laou kwōyādaḡīousītlo,	*If they had*	

Pluperfect Progressive Tense.

Tlaou kwōyādaḡīḡungastlo,	*If I had*	
Dahou "	*If thou hadst*	
Laou "	*If he had*	
Talung "	*If we had*	*been loving.*
Dalung "	*If ye had*	
Ltha "	*If they had*	
Laou kwōyādaḡīouḡungastlo,	*If they had*	

Future Tense.

Tlaou kwōyādasēstlo,	*If I shall*	
Dahou "	*If thou wilt*	
Laou "	*If he will*	
Talung "	*If we shall*	*love.*
Dalung "	*If ye will*	
Ltha "	*If they will*	
Laou kwōyādawasēstlo,	*If they will*	

Future Progressive Tense.

Tlaou kwōyādagīgungsēstlo,	*If I shall*	*be loving.*
Dahou "	*If thou wilt*	
Laou "	*If he will*	
Talung "	*If we shall*	
Dalung "	*If ye will*	
Ltha "	*If they will*	
Laou kwōyādagīgungwasēstlo,	*If they will*	

Future Perfect Tense.

Tlaou kwōyādagungasēstlo,	*If I shall*	*have loved.*
Dahou "	*If thou wilt*	
Laou "	*If he will*	
Talung "	*If we shall*	
Dalung "	*If ye will*	
Ltha "	*If they will*	
Laou kwōyādagungwasēstlo,	*If they will*	

Future Perfect Progressive Tense.

Tlaou kwōyādagungungasēstlo,	*If I shall*	*have been loving.*
Dahou "	*If thou will*	
Laou "	*If he will*	
Talung "	*If we shall*	
Dalung "	*If ye will*	
Ltha "	*If they will*	
Laou "	*If they will*	

POTENTIAL.

Present Tense.

Tlaou kwōyādahangung,	*I may*	*or can love.*
Dahou "	*Thou mayst*	
Laou "	*He may*	
Talung "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Laou kwōyādouhangung,	*They may*	

Progressive Tense.

Tlaou kwōyādagunghangung,	*I may*	*or can be loving.*
Dahou "	*Thou mayst*	
Laou "	*He may*	
Talung "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Laou kwōyādougunghangung,	*They may*	

Past and Future Tenses.

Tlaou kwōyādāhasingung,	*I may*	love.
Dahou "	*Thou mayst*	
Laou "	*He may*	
Talung "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Laou kwōyādawāhasingung,	*They may*	

Past and Future Progressive Tenses.

Tlaou kwōyādagīhasingung,	*I may*	be always loving.
Dahou "	*Thou mayst*	
Laou "	*He may*	
Talung "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Laou kwōyādougīhasingung,	*They may*	

Perfect Tense.

Tlaou kwōyādagangahangung,	*I may*	have loved.
Dahou "	*Thou mayst*	
Laou "	*He may*	
Talung "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Laou kwōyādougangahangung,	*They may*	

Perfect Progressive Tense.

Tlaou kwōyādaiahangung,	*I may*	have always loved.
Dahou "	*Thou mayst*	
Laou "	*He may*	
Talung "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Laou kwōyādawaiahangung,	*They may*	

PURE CONJUNCTIVE MOOD.

Present Tense.

Tlaou kwōyādiē lāgung,	*I should*	love.
Dahou " "	*Thou shouldst*	
Laou " "	*He should*	
Talung " "	*We should*	
Dalung " "	*Ye should*	
Ltha " "	*They should*	
Laou " louwang,	*They should*	

Present Progressive Tense.

Tlaou kwōyādiē lāgungung,	*I should*	*be loving*
Dahou " "	*Thou shouldst*	
Laou " "	*He should*	
Talung " "	*We should*	
Dalung " "	*Ye should*	
Ltha " "	*They should*	
Laou " lāgungwang,	*They should*	

Perfect Tense.

Tlaou kwōyādiē lāgīni,	*I should*	*have loved.*
Dahou " "	*Thou shouldst*	
Laou " "	*He should*	
Talung " "	*We should*	
Dalung " "	*Ye should*	
Ltha " "	*They should*	
Laou " lougīni,	*They should*	

Perfect Progressive Tense.

Tlaou kwōyādiē lāgun,	*I should*	*have been loving.*
Dahou " "	*Thou shouldst*	
Laou " "	*He should*	
Talung " "	*We should*	
Dalung " "	*Ye should*	
Ltha " "	*They should*	
Laou " lougun,	*They should*	

CONDITIONAL CONJUNCTIVE MOOD.

Present Tense.

Tlaou kwōyādatlingāgung,	*I would*	*love.*
Dahou "	*Thou wouldst*	
Laou "	*He would*	
Talung "	*We would*	
Dalung "	*Ye would*	
Ltha "	*They would*	
Laou kwōyādatlingougung,	*They would*	

Present Progressive Tense.

Tlaou kwōyādatlingāgungung,	*I would*	*be loving.*
Dahou "	*Thou wouldst*	
Laou "	*He would*	
Talung "	*We would*	
Dalung "	*Ye would*	
Ltha "	*They would*	
Laou kwōyādatlingwogungung,	*They would*	

Imperfect Tense.

Tlaou kwōyādiēan,	*I might*	*love.*
Dahou "	*Thou mightst*	
Laou "	*He might*	
Talung "	*We might*	
Dalung "	*Ye might*	
Ltha "	*They might*	
Laou kwōyādawēan,	*They might*	

Perfect Tense.

Tlaou kwōyādatlingāgīni,	*I would*	*have loved.*
Dahou "	*Thou wouldst*	
Laou "	*He would*	
Talung "	*We would*	
Dalung "	*Ye would*	
Ltha "	*They would*	
Laou kwōyādatlingwogīni,	*They would*	

Perfect Progressive Tense.

Tlaou kwōyādatlingāgun,	*I would*	*have been loving.*
Dahou "	*Thou wouldst*	
Laou "	*He would*	
Talung "	*We would*	
Dalung "	*Ye would*	
Ltha "	*They would*	
Laou kwōyādatlingwogun,	*They would*	

INFINITIVE MOOD.

Present,	Kwōyādiē,	*To love.*
Present progressive,	Kwōyādagīgē,	*To be loving*
Perfect,	Kwōyādagunē,	*To have loved.*
Perfect progressive,	Kwōyādagīgunē,	*To have been loving.*

PARTICIPLES.

Present,	Kwōyādas,	*Loving.*
Present progressive,	Kwōyādagīgīni,	*Having been loving.*
Perfect,	Kwōyādagūni,	*Having loved.*

D. PASSIVE VOICE.

NOTE.—The passive voice is very rarely used in the Haida language.

Conjugation II.

INDICATIVE MOOD.

Present Tense.

Dī kwōyādiāgung,	*I am*	*loved.*
Dung "	*Thou art*	
Il "	*He is*	
Ītil "	*We are*	
Dalung "	*Ye are*	
Ltha "	*They are*	

Present Imperfect Tense.

Dī kwōyādiāgūngūng	*I am*	*being loved.*
Dung "	*Thou art*	
Il "	*He is*	
Ītil "	*We are*	
Dalung "	*Ye are*	
Ltha "	*They are*	

Past Tense.

Dī kwōyādiāgūni,	*I was*	*loved.*
Dung "	*Thou wast*	
Il "	*He was*	
Ītil "	*We were*	
Dalung "	*Ye were*	
Ltha "	*They were*	

Past Imperfect Tense.

Dī kwoyādiāgīgīni,	*I was*	*being loved.*
Dung "	*Thou wast*	
Il "	*He was*	
Ītil "	*We were*	
Dalung "	*Ye were*	
Ltha "	*They were*	

Perfect Tense.

Dī kwōyādiāgīni,	*I have*	*been loved.*
Dung "	*Thou hast*	
Il "	*He has*	
Ītil "	*We have*	
Dalung "	*Ye have*	
Ltha "	*They have*	

Perfect Progressive.

Dī kwōyādiāgūn,	*I have*	*more than once been loved.*
Dung "	*Thou hast*	
Il "	*He has*	
Ītil "	*We have*	
Dalung "	*Ye have*	
Ltha "	*They have*	

Pluperfect Tense.

Dī kwōyādiāgīgūngwau,	*I have*	*been loved.*
Dung "	*Thou hadst*	
Il "	*He had*	
Ītil "	*We had*	
Dalung "	*Ye had*	
Ltha "	*They had*	

Pluperfect Progressive Tense.

Dī kwōyādiāgīgunūgung,	*I had*	*been loved more than once.*
Dung "	*Thou hadst*	
Il "	*He had*	
Ītil "	*We had*	
Dalung "	*Ye had*	
Ltha "	*They had*	

Future Tense.

Dī kwōyādiāsang,	*I shall*	*be loved.*
Dung "	*Thou will*	
Il "	*He will*	
Ītil "	*We shall*	
Dalung "	*Ye will*	
Ltha "	*They will*	

Future Perfect Tense.

Dī kwōyādiāgungsang,	*I shall*	*have been loved.*
Dung "	*Thou will*	
Il "	*He will*	
Ītil "	*We shall*	
Dalung "	*Ye will*	
Ltha "	*They shall*	

Future Perfect Progressive.

Dī kwōyādiāgīgungsang,	*I shall*	*have been loved more than once.*
Dung "	*Thou will*	
Il "	*He will*	
Ītil "	*We shall*	
Dalung "	*Ye will*	
Ltha "	*They will*	

INTENTIONAL FORM.

Present Tense.

Dī kwōyādiāungkasang,	*I am*	*about to be loved.*
Dung "	*Thou art*	
Il "	*He is*	
Ītil "	*We are*	
Dalung "	*Ye are*	
Ltha "	*They are*	

Imperfect Tense.

Dī kwōyādiā talgung,	*I am*	*going to be loved.*
Dung " "	*Thou art*	
Il " "	*He is*	
Ītil " "	*We are*	
Dalung " "	*Ye are*	
Ltha " "	*They are*	

Past Tense.

Dī kwōyādiāungkagīgīni,	*I was*	*about to be loved.*
Dung "	*Thou wast*	
Il "	*He was*	
Ītil "	*We were*	
Dalung "	*Ye were*	
Ltha "	*They were*	

Future Tense.

Dī kwōyādiāgīungkasang,	*I shall*	*be about to be loved.*
Dung "	*Thou wilt*	
Il "	*He will*	
Ītil "	*We shall*	
Dalung "	*Ye will*	
Ltha "	*They will*	

IMPERATIVE MOOD.

Present Tense.

Agwan lth dī kwōyādada,	*Let me*	*be loved.*
Agwan lth dung kwōyādada,	*Be thou*	
Agwan lth il kwōyādada,	*Let him*	
Agwan lth itil kwōyādada,	*Let us*	
Agwan lth dalung kwōyādada,	*Be ye*	
Agwan lth ltha kwōyādada,	*Let them*	

Present Progressive Tense.

Agwan lth dī kwōyādagīda,	*Let me*	*be continually loved.*
Agwan lth dung kwōyādagīda,	*Be thou*	
Agwan lth il kwōyādagīda,	*Let him*	
Agwan lth ītil kwōyādagīda,	*Let us*	
Agwan lth dalung kwōyādagīda,	*Be ye*	
Agwan lth ltha kwōyādagīda,	*Let them*	

SUBJUNCTIVE MOOD.

Present Tense.

Dī kwōyādiāstlo,	*If I*	*be loved.*
Dung "	*If thou*	
Il "	*If he*	
Ītil "	*If we*	
Dalung "	*If ye*	
Ltha "	*If they*	

Present Imperfect.

Dī kwōyādiāgungstlo,	*If I*	*be continually loved.*
Dung "	*If thou*	
Il "	*If he*	
Ītil "	*If we*	
Dalung "	*If ye*	
Ltha "	*If they*	

Past Tense.

Dī kwōyādiāgunstlo,		*If I were*	*loved.*
Dung	"	*If thou wast*	
Il	"	*If he were*	
Ītil	"	*If we were*	
Dalung	"	*If ye were*	
Ltha	"	*If they were*	

Past Imperfect Tense.

Dī kwōyādiāgīganastlo,		*If I were*	*continually loved.*
Dung	"	*If thou wert*	
Il	"	*If he were*	
Ītil	"	*If we were*	
Dalung	"	*If ye were*	
Ltha	"	*If they were*	

Perfect Tense.

Dī kwōyādiāgīgastlo,		*If I have*	*been loved.*
Dung	"	*If thou hast*	
Il	"	*If he has*	
Ītil	"	*If we have*	
Dalung	"	*If ye have*	
Ltha	"	*If they have*	

Perfect Progressive Tense.

Dī kwōyādiāganastlo,		*If I have*	*been continually loved.*
Dung	"	*If thou hast*	
Il	"	*If he has*	
Ītil	"	*If we have*	
Dalung	"	*If ye have*	
Ltha	"	*If they have*	

Pluperfect Tense.

Dī kwōyādiāgīgasītlo,		*If I had*	*been loved.*
Dung	"	*If thou hadst*	
Il	"	*If he had*	
Ītil	"	*If we had*	
Dalung	"	*If ye had*	
Ltha	"	*If they had*	

Pluperfect Progressive Tense.

Dī kwōyādiāgīganasītlo,		*If I had*	*been continually loved.*
Dung	"	*If thou hadst*	
Il	"	*If he had*	
Ītil	"	*If we had*	
Dalung	"	*If ye had*	
Ltha	"	*If they had*	

Future Tense.

Dī kwōyādiāsēstlo,	*If I shall*	*be loved.*
Dung "	*If thou wilt*	
Il "	*If he will*	
Ītil "	*If we shall*	
Dalung "	*If ye will*	
Ltha "	*If they will*	

Future Progressive Tense.

Dī kwōyādiāgīgungsēstlo,	*If I shall*	*be continually loved.*
Dung "	*If thou wilt*	
Il "	*If he will*	
Ītil "	*If we shall*	
Dalung "	*If ye will*	
Ltha "	*If they will*	

Future Perfect Tense.

Dē kwōyādiāgungasēstlo,	*If I shall*	*have been loved.*
Dung "	*If thou wilt*	
Il "	*If he will*	
Ītil "	*If we shall*	
Dalung "	*If ye will*	
Ltha "	*If they will*	

Future Perfect Progressive Tense.

Dī kwōyādiāgungungasēstlo,	*If I shall*	*have been continually loved.*
Dung "	*If thou wilt*	
Il "	*If he will*	
Ītil "	*If we shall*	
Dalung "	*If ye will*	
Ltha "	*If they will*	

Potential Mood.

Present Tense.

Dī kwōyādiābangung,	*I may*	*or can be loved.*
Dung, "	*Thou mayst*	
Il "	*He may*	
Ītil "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	

Present Progressive Tense.

Dī kwōyādiāgunghangung,	*I may*	*or can be continually loved.*
Dung "	*Thou mayst*	
Il "	*He may*	
Ītil "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	

Past and Future Tenses.

Dī kwōyādiāhasingūng,	*I may*	*be loved.*
Dung "	*Thou mayst*	
Il "	*He may*	
Ītil "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	

Past and Future Progressive Tenses.

Dī kwōyādiāgīhasingūng,	*I may*	*be continually loved.*
Dung "	*Thou mayst*	
Il "	*He may*	
Ītil "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	

Perfect Tense.

Dī kwōyādiāgangahangūng,	*I may*	*have been loved.*
Dung "	*Thou mayst*	
Il "	*He may*	
Ītil "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	

Perfect Progressive Tense.

Dī kwōyādiāgīgangahangūng,	*I may*	*have been continually loved.*
Dung "	*Thou mayst*	
Il "	*He may*	
Ītil "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	

PURE CONJUNCTIVE MOOD.

Present Tense.

Dī kwōyādiā lāgung,	*I should*	*be loved.*
Dung " "	*Thou shouldst*	
Il " "	*He should*	
Ītil " "	*We should*	
Daluug " "	*Ye should*	
Ltha " "	*They should*	

Present Progressive Tense.

Dī kwōyādiā lāgungūng,	*I should*	*be continually loved.*
Dung " "	*Thou shouldst*	
Il " "	*He should*	
Ītil " "	*We should*	
Dalung " "	*Ye should*	
Ltha " "	*They should*	

Perfect Progressive Tense.

Dī kwōyādiā lāgun,	*I should*	*have been continually loved.*
Dung " "	*Thou shouldst*	
Il " "	*He should*	
Ītil " "	*We should*	
Dalung " "	*Ye should*	
Ltha " "	*They should*	

Conditional Conjunctive Mood.

Present Tense.

Dī kwōyādiātlingāgung,	*I would*	*be loved.*
Dung "	*Thou wouldst*	
Il "	*He would*	
Ītil "	*We would*	
Dalung "	*Ye would*	
Ltha "	*They would*	

Present Progressive Tense.

Dī kwōyādiātlingāgungung,	*I would*	*be continually loved*
Dung "	*Thou wouldst*	
Il "	*He would*	
Ītil "	*We would*	
Dalung "	*Ye would*	
Ltha "	*They would*	

Perfect Tense.

Dī kwōyādiātlingāgīni,	*I would*	*have been loved.*
Dung "	*Thou wouldst*	
Il "	*He would*	
Ītil "	*We would*	
Dalung "	*Ye would*	
Ltha "	*They would*	

Perfect Progressive Tense.

Dī kwōyādiātlingāgun,	*I would*	*have been continually loved.*
Dung "	*Thou wouldst*	
Il "	*He would*	
Ītil "	*We would*	
Dalung "	*Ye would*	
Ltha "	*They would*	

Infinitive Mood.

Present,	Kwōyādiādē,	*To be loved*
Present Progressive,	Kwōyādiāgīgē,	*To be continually loved.*
Perfect,	Kwōyādiāgunē,	*To have been* or *to be loved.*
Perfect Progressive,	Kwōyādiāgīgunē,	*To have been continually loved.*

PARTICIPLES.

Present,	Kwōyādiās,	*Being loved.*
Present Progressive,	Kwōyādiāgīgīni,	*Being continually loved.*
Perfect,	Kwōyādiāguni,	*Loved* or *having been loved.*

E. NEGATIVE FORM.—"Not to write."

I shall now conjugate the verb "to write," and as the active and passive voices are similar to those of "kwōyāda" already conjugated, I shall conjugate its negative form in the active voice only.

CONJUGATION III.

Indicative Mood.

ACTIVE VOICE.

Present Tense.

Kum	lth kālungāngung,	*I do*	*not write.*
"	dung "	*Thou dost*	
"	il "	*He does*	
"	talung "	*We do*	
"	dalung "	*Ye do*	
"	ltha "	*They do*	
"	il kālungwāngung,	*They do*	

Present Progressive Tense.

Kum	lth kālungungāngung,	*I am*	*not writing.*
"	dung "	*Thou art*	
"	il "	*He is*	
"	talung "	*We are*	
"	dalung "	*Ye are*	
"	ltha "	*They are*	
"	il kālungungwāngung,	*They are*	

Past Tense.

Kum	lth kālungāguni,	*I did*	*not write.*
"	dung "	*Thou didst*	
"	il "	*He did*	
"	talung "	*We did*	
"	dalung "	*Ye did*	
"	ltha "	*They did*	
"	il kālungwāguni,	*They did*	

Past Imperfect Tense.

Kum	lth kālungāgīgīni,	*I was*	*not writing.*
"	dung "	*Thou wast*	
"	il "	*He was*	
"	talung "	*We were*	
"	dalung "	*Ye were*	
"	ltha "	*They were*	
"	il kālungwāgīgīni,	*They were*	

Perfect Tense

Kum lth kālungāngīni,	*I have*	*not written.*
" dung "	*Thou hast*	
" il "	*He has*	
" talung "	*We have*	
" dalung "	*Ye have*	
" ltha "	*They have*	
" il kālungwāngīni,	*They have*	

Perfect Progressive Tense.

Kum lth kālungāngun,	*I have*	*not been writing.*
" dung "	*Thou hast*	
" il "	*He has*	
" talung "	*We have*	
" dalung "	*Ye have*	
" ltha "	*They have*	
" il kālungwāngun,	*They have*	

Pluperfect Tense.

Kum lth kālungīāngungwau,	*I had*	*not written.*
" dung "	*Thou hadst*	
" il "	*He had*	
" talung "	*We had*	
" dalung "	*Ye had*	
" ltha "	*They had*	
" il kālungīouāngungwau,	*They had*	

Pluperfect Progressive Tense.

Kum lth kālungīgungāngung,	*I had*	*not been writing.*
" dung "	*Thou hadst*	
" il "	*He had*	
" talung "	*We had*	
" dalung "	*Ye had*	
" ltha "	*They had*	
" il kālungīgungwāngung,	*They had*	

Future Tense.

Kum lth kālungāngsang,	*I shal*	*not write.*
" dung "	*Thou wilt*	
" il "	*He will*	
" talung "	*We shall*	
" dalung "	*Ye will*	
" ltha "	*They will*	
" il kālungwāngsang,	*They will*	

Future Perfect Tense.

Kum	lth kālunḡungāngsang,		*I shall*	*not be writing.*
"	dung	"	*Thou wilt*	
"	il	"	*He will*	
"	talung	"	*We shall*	
"	dalung	"	*Ye will*	
"	ltha	"	*They will*	
"	il kālunḡungwāngsang,		*They will*	

Future Perfect Tense.

Kum	lth kālunḡunḡungāngsang,		*I shall*	*not have written.*
"	dung	"	*Thou wilt*	
"	il	"	*He will*	
"	talung	"	*We shall*	
"	dalung	"	*Ye will*	
"	ltha	"	*They will*	
"	il	"	*They will*	

Future Perfect Progressive Tense.

Kum	lth kālunḡīḡungāngsang,		*I shall*	*not have been writing.*
"	dung	"	*Thou wilt*	
"	il	"	*He will*	
"	talung	"	*We shall*	
"	dalung	"	*Ye will*	
"	ltha	"	*They will*	
"	il kālunḡīḡungwāngsang,		*They will*	

INTENTIONAL FORM.

Present Tense.

Kum	lth kālungungkashānḡung,		*I am*	*not about to write.*
"	dung	"	*Thou art*	
"	il	"	*He is*	
"	talung	"	*We are*	
"	dalung	"	*Ye are*	
"	ltha	"	*They are*	
"	il kālungungkashwānḡung,		*They are*	

Imperfect Tense.

Kum	lth kālungatalānḡung,		*I am*	*not going to write.*
"	dung	"	*Thou art*	
"	il	"	*He is*	
"	talung	"	*We are*	
"	dalung	"	*Ye are*	
"	ltha	"	*They are*	
"	il kālungatalwānḡung,		*They are*	

Past Tense.

Kum	lth kālungungkaāngīgīni,	*I was*	*not about to write.*
"	dung "	*Thou wast*	
"	il "	*He was*	
"	talung "	*We were*	
"	dalung "	*Ye were*	
"	ltha "	*They were*	
"	il kālungungkawāngīgīni,	*They were*	

Future Tense.

Kum	lth kālungīānungkasang,	*I shall*	*not be about to write.*
"	dung "	*Thou wilt*	
"	il "	*He will*	
"	talung "	*We shall*	
"	dalung "	*Ye will*	
"	ltha "	*They will*	
"	il kālungīwānungkasang,	*They will*	

Imperative Mood.

Present Tense.

Kum	lth kālungāndzing,	*Let me*	*not write.*
"	lth kālungāng,	*Do thou*	
"	il kālungāndzing,	*Let him*	
"	talung kālungāndzing,	*Let us*	
"	lth kālungāngo,	*Do ye*	
"	ltha kālungāndzing,	*Let them*	
"	il kālungwandzing,	*Let them*	

Present Progressive.

Kum	lth kālungīāndzing,	*Let me*	*not be always writing.*
"	lth kālungīāng,	*Do thou*	
"	il kālungīāndzing,	*Let him*	
"	talung kālungīāndzing,	*Let us*	
"	lth kālungīāngo,	*Do ye*	
"	ltha kālungīāndzing,	*Let them*	
"	il kālungīwāndzing,	*Let them*	

Historic Form.

Past Tense.

Kum	lth kālangāngang,	*I did*	*not write.*
"	dung "	*Thou didst*	
"	il "	*He did*	
"	talung "	*We did*	
"	dalung "	*Ye did*	
"	ltha "	*They did*	
"	il kālangwāngang,	*They did*	

Pluperfect Tense.

Kum lth kālungānḡangang,	*I had*	*not written.*
" dung "	*Thou hadst*	
" il "	*He had*	
" talung "	*We had*	
" dalung "	*Ye had*	
" ltha "	*They had*	
" il kālungwānḡangang,	*They had.*	

FORM DENOTING A DESIRE OR WISH.

Present Tense.

Kum lth kālunḡe da kwudungānḡung,	*I do*	*not wish to write.*
" dung " " "	*Thou dost*	
" il " " "	*He does*	
" talung " " "	*We do*	
" dalung " " "	*Ye do*	
" ltha " " "	*They do*	
" il " " kwudungāngwang,	*They do*	

Past Tense.

Kum lth kālungē da kwudungānḡuni,	*I did*	*not wish to write.*
" dung " " "	*Thou didst*	
" il " " "	*He did*	
" talung " " "	*We did*	
" dalung " " "	*Ye did*	
" ltha " " "	*They did*	
" il " " kwudungwānḡuni,	*They did*	

Future Tense.

Kum lth kālunḡē da kwudungāngsang,	*I shall*	*not wish to write.*
" dung " " "	*Thou wilt*	
" il " " "	*He will*	
" talung " " "	*We shall*	
" dalung " " "	*Ye will*	
" ltha " " "	*They will*	
" il " " kwudungwāngsang,	*They will*	

SUBJUNCTIVE MOOD.

Present Tense.

Kum lth kālungānstlo,	*If I do*	*not write.*
" dung "	*If thou dost*	
" il "	*If he does*	
" talung "	*If we do*	
" dalung "	*If ye do*	
" ltha "	*If they do*	
" il kālungwānstlo,	*If they do*	

Present Progressive Tense.

Kum lth kālungūngānstlo,	*If I be*	*not writing.*
" dung "	*If thou art*	
" il "	*If he is*	
" talung "	*If we are*	
" dalung "	*If ye are*	
" ltha "	*If they are*	
" il kālungūngwānstlo.	*If they are*	

Past Tense.

Kum lth kālungāngastlo,	*If I did*	*not write.*
" dung "	*If thou didst*	
" il "	*If he did*	
" talung "	*If we did*	
" dalung "	*If ye did*	
" ltha "	*If they did*	
" il kālungwāngastlo,	*If they did*	

Past Progressive Tense.

Kum lth kālungīīganāngastlo,	*If I were*	*not writing.*
" dung "	*If thou wert*	
" il "	*If he were*	
" talung "	*If we were*	
" dalung "	*If ye were*	
" ltha "	*If they were*	
" il kālungīīganwāngastlo,	*If they were*	

Perfect Tense.

Kum lth kālungīāngastlo,	*If I have*	*not written.*
" dung "	*If thou hast*	
" il "	*If he has*	
" talung "	*If we have*	
" dalung "	*If ye have*	
" ltha "	*If they have*	
" il kālungīwāngastlo,	*If they have*	

Perfect Progressive Tense.

Kum lth kālungūngāngasītlo,	*If I have*	*not been writing.*
" dung "	*If thou hast*	
" il "	*If he has*	
" talung "	*If we have*	
" dalung "	*If ye have*	
" ltha "	*If they have*	
" il kālungūngwāngasītlo,	*If they have*	

Pluperfect Tense.

Kum	lth kālungīāngasītlo,	*If I had*	*not written.*
"	dung "	*If thou hadst*	
"	il "	*If he had*	
"	talung "	*If we had*	
"	dalung "	*If ye had*	
"	ltha "	*If they had*	
"	il kālungīwāngasītlo,	*If they had*	

Pluperfect Perfect Tense.

Kum	lth kālungīgungānstlo,	*If I had*	*not been writing.*
"	dung "	*If thou hadst*	
"	il "	*If he had*	
"	talung "	*If we had*	
"	dalung "	*If ye had*	
"	ltha "	*If they had*	
"	il kālungīgungwānstlo,	*If they had*	

Future Tense.

Kum	lth kālungāngsēstlo,	*If I shall*	*not write.*
"	dung "	*If thou wilt*	
"	il "	*If he will*	
"	talung "	*If we shall*	
"	dalung "	*If ye will*	
"	ltha "	*If they will*	
"	il kālungwāngsēstlo,	*If they will*	

Future Progressive Tense.

Kum	lth kālungīgungāngsēstlo,	*If I shall*	*not be writing.*
"	dung "	*If thou wilt*	
"	il "	*If he will*	
"	talung "	*If we shall*	
"	dalung "	*If ye will*	
"	ltha "	*If they will*	
"	il kālungīgungwāngsēstlo,	*If they will*	

Future Perfect Tense.

Kum	lth kālungungāngsēstlo,	*If I shall*	*not have written.*
"	dung "	*If thou wilt*	
"	il "	*If he will*	
"	talung "	*If we shall*	
"	dalung "	*If ye will*	
"	ltha "	*If they will*	
"	il kālungungwāngsēstlo,	*If they will*	

Future Perfect Progressive Tense.

Kum lth kālungūngūngāngsēstlo,	*If I shall*	*not have been writing.*
" dung "	*If thou wilt*	
" il "	*If he will*	
" talung "	*If we shall*	
" dalung "	*If ye will*	
" ltha "	*If they will*	
" il kālungūngūngwāngsēstlo,	*If they will*	

POTENTIAL MOOD.

Present Tense.

Kum lth kālungānhangūng,	*I may*	or *can not write.*
" dung "	*Thou mayst*	
" il "	*He may*	
" talung "	*We may*	
" dalung "	*Ye may*	
" ltha "	*They may*	
" il kālungwānhangūng,	*They may*	

Present Progressive Tense.

Kum lth kālungūngānhangūng,	*I may*	or *can not be writing.*
" dung "	*Thou mayst*	
" il "	*He may*	
" talung "	*We may*	
" dalung "	*Ye may*	
" ltha "	*They may*	
" il kālungūngwānhangūng,	*They may*	

Past and Future Tenses.

Kum lth kālungānhasingūng,	*I may*	*not write.*
" dung "	*Thou mayst*	
" il "	*He may*	
" talung "	*We may*	
" dalung "	*Ye may*	
" ltha "	*They may*	
" il kālungwānhasingūng,	*They may*	

Past and Future Progressive Tenses.

Kum lth kālungīānghasingūng,	*I may*	*not be writing.*
" dung "	*Thou mayst*	
" il "	*He may*	
" talung "	*We may*	
" dalung "	*Ye may*	
" ltha "	*They may*	
" il kālungīwānghasingūng,	*They may*	

Perfect Tense.

Kum	lth kālungānganahangung,		*I may*	*not have written.*
"	dung	"	*Thou mayst*	
"	il	"	*He may*	
"	talung	"	*We may*	
"	dalung	"	*Ye may*	
"	ltha	"	*They may*	
"	il kālungwānganahangung,		*They may*	

Perfect Progressive Tense.

Kum	lth kālungānganahangung,		*I may*	*not have been writing.*
"	dung	"	*Thou mayst*	
"	il	"	*He may*	
"	talung	"	*We may*	
"	dalung	"	*Ye may*	
"	ltha	"	*They may*	
"	il kālungwānganahangung,		*They may*	

PURE CONJUNCTIVE MOOD.

Present Tense.

Kum	lth kālungē lāngung,		*I should*	*not write.*
"	dung	" "	*Thou shouldst*	
"	il	" "	*He should*	
"	talung	" "	*We should*	
"	dalung	" "	*Ye should*	
"	ltha	" "	*They should*	
"	il	" lāngwang,	*They should*	

Present Progressive Tense.

Kum	lth kālungē lāgungāngung,		*I should*	*not be writing.*
"	dung	" "	*Thou shouldst*	
"	il	" "	*He should*	
"	talung	" "	*We should*	
"	dalung	" "	*Ye should*	
"	ltha	" "	*They should*	
"	il	" lāgungāngwang.	*They should*	

Perfect Tense.

Kum	lth kālungē lāngīni,		*I should*	*not have written.*
"	dung	" "	*Thou shouldst*	
"	il	" "	*He should*	
"	talung	" "	*We should*	
"	dalung	" "	*Ye should*	
"	ltha	" "	*They should*	
"	il	" lāwāngīni,	*They should*	

Perfect Progressive Tense.

Kum lth kālungē lāngun,	*I should*	*not have been writing.*
" dung " "	*Thou shouldst*	
" il " "	*He should*	
" talung " "	*We should*	
" dalung " "	*Ye should*	
" ltha " "	*They should*	
" il " lāwāngun,	*They should*	

CONDITIONAL CONJUNCTIVE MOOD.

Present Tense.

Kum lth kālungātlingāngung,	*I would*	*not write.*
" dung "	*Thou wouldst*	
" il "	*He would*	
" talung "	*We would*	
" dalung "	*Ye would*	
" ltha "	*They would*	
" il kālungātlingwāngung,	*They would*	

Present Progressive Tense.

Kum lth kālungātlingungāngung,	*I would*	*not be writing.*
" dung " "	*Thou wouldst*	
" il " "	*He would*	
" talung " "	*We would*	
" dalung " "	*Ye would*	
" ltha " "	*They would*	
" il kālungātlingungwāngung,	*They would*	

Imperfect Tense.

Kum lth kālungāngēan,	*I might*	*not write.*
" dung "	*Thou mightst*	
" il "	*He might*	
" talung "	*We might*	
" dalung "	*Ye might*	
" ltha "	*They might*	
" il kālungwāngēan	*They might*	

Perfect Tense.

Kum lth kālungātlingāngīni,	*I would*	*not have written.*
" dung "	*Thou wouldst*	
" il "	*He would*	
" talung "	*We would*	
" dalung "	*Ye would*	
" ltha "	*They would*	
" il kālungātlingwāngīni,	*They would*	

Perfect Progressive Tense.

Kum lth kālungātlingāngun,		*I would*	*not have been writing.*
" dung	"	*Thou wouldst*	
" il	"	*He would*	
" talung	"	*We would*	
" dalung	"	*Ye would*	
" ltha	"	*They would*	
" il kālungātlingwāngun,		*They would*	

INFINITIVE MOOD.

Present,	Kum kālungānē,	*Not to write.*
Present Progressive,	Kum kālungīāngē,	*Not to be writing.*
Perfect,	Kum kālungungānē,	*Not to have written.*
Perfect Progressive,	Kum kālungīgungānē,	*Not to have been writing.*

PARTICIPLES.

Present,	Kum kālungāns,	*Not writing.*
Present Progressive,	Kum kālungīāngīni,	*Not having been writing.*
Perfect,	Kum kālungāngūni,	*Not having written.*

F. DEPONENT VERBS.

A Deponent Verb is chiefly passive in form, but active in sense. All Deponent Verbs are conjugated like the verb *stīgē* "to be ill." I shall now conjugate the Deponent Verb *stigē*.

Conjugation IV.

INDICATIVE MOOD.

Present Tense.

Dī	stigung,	*I am*	*ill.*
Dung	"	*Thou art*	
Il	"	*He is*	
Ītil	"	*We are*	
Dalung	"	*Ye are*	
Ltha	"	*They are*	
Il	stiwang,	*They are*	

Present Progressive Tense.

Dī	stigungung,	*I am*	*being ill.*
Dung	"	*Thou art*	
Il	"	*He is*	
Ītil	"	*We are*	
Dalung	"	*Ye are*	
Ltha	"	*They are*	
Il	stigungwang,	*They are*	

Past Tense.

Dī stīguni,	*I was*	*ill.*
Dung "	*Thou wast*	
Il "	*He was*	
Ītil "	*We were*	
Dalung "	*Ye were*	
Ltha "	*They were*	
Il stiwuni,	*They were*	

Past Progressive Tense.

Dī stīgīgīni,	*I was*	*being ill.*
Dung "	*Thou wast*	
Il "	*He was*	
Ītil "	*We were*	
Dalung "	*Ye were*	
Ltha "	*They were*	
Il stigīwīni,	*They were*	

Perfect Tense.

Dī stigīni,	*I have*	*been ill.*
Dung "	*Thou hast*	
Il "	*He has*	
Ītil "	*We have*	
Dalung "	*Ye have*	
Ltha "	*They have*	
Il stiwīni	*They have*	

Perfect Progressive Tense.

Dī stigun,	*I have*	*been more than once ill.*
Dung "	*Thou hast*	
Il "	*He has*	
Ītil "	*We have*	
Dalung "	*Ye have*	
Ltha "	*They have*	
Il stiwun,	*They have*	

Pluperfect Tense.

Dī stigīgungwau,	*I had*	*been ill.*
Dung "	*Thou hadst*	
Il "	*He had*	
Ītil "	*We had*	
Dalung "	*Ye had*	
Ltha "	*They had*	
Il stigīwungwau,	*They had*	

Pluperfect Progressive Tense.

Dī stiḡīḡunḡung,	*I had*	*been more than once ill.*
Dung "	*Thou hadst*	
Il "	*He had*	
Ītil "	*We had*	
Dalung "	*Ye had*	
Ltha "	*They had*	
Il stīḡīḡungwang,	*They had*	

Future Tense.

Dī stiasang,	*I shall*	*be ill.*
Dung "	*Thou wilt*	
Il "	*He will*	
Ītil "	*We shall*	
Dalung "	*Ye will*	
Ltha "	*They will*	
Il stiwāsang	*They will*	

Future Perfect Tense.

Dī stiḡungsang,	*I shall*	*have been ill.*
Dung "	*Thou wilt*	
Il "	*He will*	
Ītil "	*We shall*	
Dalung "	*Ye will*	
Ltha "	*They will*	
Il stiḡungwāsang,	*They will*	

Future Perfect Progressive Tense.

Dī stiḡīḡungsang,	*I shall*	*have been more than once ill.*
Dung "	*Thou wilt*	
Il "	*He will*	
Ītil "	*We shall*	
Dalung "	*Ye will*	
Ltha "	*They will*	
Il stiḡīḡungwāsang,	*They will*	

INTENTIONAL FORM.

Present Tense.

Dī stiungkasang,	*I am*	*about to be ill.*
Dung "	*Thou art*	
Il "	*He is*	
Ītil "	*We are*	
Dalung "	*Ye are*	
Ltha "	*They are*	
Il stiungkawāsang,	*They are*	

Imperfect Tense.

Dī stigulthtalgung,	*I am*	*going to be ill.*
Dung "	*Thou art*	
Il "	*He is*	
Ītil "	*We are*	
Dalung "	*Ye are*	
Ltha "	*They are*	
Il stigulthtalwang,	*They are*	

Past Tense.

Dī stiungkagīgīni,	*I was*	*about to be ill.*
Dung "	*Thou wast*	
Il "	*He was*	
Ītil "	*We were*	
Dalung "	*Ye were*	
Ltha "	*They were*	
Il stiungkagīwīni,	*They were*	

Future Tense.

Dī stigīungkasang,	*I shall*	*be about to be ill.*
Dung "	*Thou wilt*	
Il "	*He will*	
Ītil "	*We shall*	
Dalung "	*Ye will*	
Ltha "	*They will*	
Il stigīungkawāsang,	*They will*	

IMPERATIVE MOOD.

Present Tense.

Agwan lth dī stīda,	*Let me*	*be ill.*
" " dung "	*Be thou*	
" " il "	*Let him*	
" " ītil "	*Let us*	
" " dalung "	*Be ye*	
" " ltha "	*Let them*	
" " il stīdwang,	*Let them*	

Present Progressive Tense.

Agwan lth dī stigīda,	*Let me*	*be continually ill.*
" " dung "	*Be thou*	
" " il "	*Let him*	
" " ītil "	*Let us*	
" " dalung "	*Be ye*	
" " ltha "	*Let them*	
" " il stigīdwang,	*Let them*	

Form Denoting a Wish or Desire.

Present Tense.

Dī	stigē da kwudungūng,	*I wish*	*to be ill.*
Dung	" " "	*Thou wishest*	
Il	" " "	*He wishes*	
Ītil	" " "	*We wish*	
Dalung	" " "	*Ye wish*	
Ltha	" " "	*They wish*	
Il	" " kwudungūng,	*They wish*	

Past Tense.

Dī	stigē da kwudungūn,	*I wished*	*to be ill.*
Dung	" " "	*Thou wishedst*	
Il	" " "	*He wished*	
Ītil	" " "	*We wished*	
Dalung	" " "	*Ye wished*	
Ltha	" " "	*They wished*	
Il	" " kwudungwun,	*They wished*	

Future Tense.

Dī	stigē da kwudungsang,	*I shall*	*wish to be ill.*
Dung	" " "	*Thou wilt*	
Il	" " "	*He will*	
Ītil	" " "	*We shall*	
Dalung	" " "	*Ye will*	
Ltha	" " "	*They will*	
Il	" " "	*They will*	

Subjunctive Mood.

Present Tense.

Dī	stistlo,	*If I*	*be ill.*
Dung	"	*If thou*	
Il	"	*If he*	
Ītil	"	*If we*	
Dalung	"	*If ye*	
Ltha	"	*If they*	
Il	stiwastlo,	*If they*	

Present Progressive Tense.

Dī	stigungstlo,	*If I*	*be continually ill.*
Dung	"	*If thou*	
Il	"	*If he*	
Ītil	"	*If we*	
Dalung	"	*If ye*	
Ltha	"	*If they*	
Il	stigungwastlo,	*If they*	

Past Tense.

Dī	stiḡunstlo,	*If I were*	*ill.*
Dung	"	*If thou wert*	
Il	"	*If he were*	
Ītil	"	*If we were*	
Dalung	"	*If ye were*	
Ltha	"	*If they were*	
Il	stiwunstlo,	*If they were*	

Past Progressive Tense.

Dī	stiḡīganastlo,	*If I were*	*continually ill.*
Dung	"	*If thou wert*	
Il	"	*If he were*	
Ītil	"	*If we were*	
Dalung	"	*If ye were*	
Ltha	"	*If they were*	
Il	stiḡīwanastlo,	*If they were*	

Perfect Tense.

Dī	stiḡīḡastlo,	*If I have*	*been ill.*
Dung	"	*If thou hast*	
Il	"	*If he has*	
Ītil	"	*If we have*	
Dalung	"	*If ye have*	
Ltha	"	*If they have*	
Il	stiḡīwastlo,	*If they have*	

Perfect Progressive Tense.

Dī	stiḡanastlo,	*If I have*	*been continually ill.*
Dung	"	*If thou hast*	
Il	"	*If he has*	
Ītil	"	*If we have*	
Dalung	"	*If ye have*	
Ltha	"	*If they have*	
Il	stiwanastlo,	*If they have*	

Pluperfect Tense.

Dī	stiḡīḡasītlo,	*If I had*	*been ill.*
Dung	"	*If thou hadst*	
Il	"	*If he had*	
Ītil	"	*If we had*	
Dalung	"	*If ye had*	
Ltha	"	*If they had*	
Il	stiḡīwasītlo,	*If they had*	

Pluperfect Progressive Tense.

Dī stiḡīḡanasītlo,	*If I had*	*been continually ill.*
Dung "	*If thou hadst*	
Il "	*If he had*	
Ītil "	*If we had*	
Dalung "	*If ye had*	
Ltha "	*If they had*	
Il stiḡīwanasītlo,	*If they had*	

Future Tense.

Dī stisēstlo,	*If I shall*	*be ill.*
Dung "	*If thou wilt*	
Il "	*If he will*	
Ītil "	*If we shall*	
Dalung "	*If ye will*	
Ltha "	*If they will*	
Il stīwāsēstlo,	*If they will*	

Future Progressive Tense.

Dī stiḡīḡungsēstlo,	*If I shall*	*be continually ill.*
Dung "	*If thou wilt*	
Il "	*If he will*	
Ītil "	*If we shall*	
Dalung "	*If ye will*	
Ltha "	*If they will*	
Il stiḡīwunsēstlo,	*If they will*	

Future Perfect Tense.

Dī stiḡungsēstlo,	*If I shall*	*have been ill.*
Dung "	*If thou wilt*	
Il "	*If he will*	
Ītil "	*If we shall*	
Dalung "	*If ye will*	
Ltha "	*If they will*	
Il stiḡungwasēstlo,	*If they will*	

Future Perfect Progressive Tense.

Dī stiḡunḡungasēstlo,	*If I shall*	*have been continually ill.*
Dung "	*If thou wilt*	
Il "	*If he will*	
Ītil "	*If we shall*	
Dalung "	*If ye will*	
Ltha "	*If they will*	
Il stiḡunḡungwāsēstlo,	*If they will*	

Potential Mood.

Present Tense.

Dī stihanḡung,	*I may*	or *can be ill.*
Dung "	*Thou mayst*	
Il "	*He may*	
Ĭtil "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Il stihangwang,	*They may*	

Present Progressive Tense.

Dī stiḡunghanḡung,	*I may*	or *can be continually ill.*
Dung "	*Thou mayst*	
Il "	*He may*	
Ĭtil "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Il stiḡunghangwang,	*They may*	

Past and Future Tenses.

Dī stihasinḡung,	*I may*	*be ill.*
Dung "	*Thou mayst*	
Il "	*He may*	
Ĭtil "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Il stihasingwang,	*They may*	

Past and Future Progressive Tenses.

Dī stiḡīhasinḡung,	*I may*	*be continually ill.*
Dung "	*Thou mayst*	
Il "	*He may*	
Ĭtil "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Il stiḡīhasingwang,	*They may*	

Perfect Tense.

Dī stiḡangahanḡung,	*I may*	*have been ill.*
Dung "	*Thou mayst*	
Il "	*He may*	
Ĭtil "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Il stiḡangahangwang,	*They may*	

Perfect Progressive.

Dī stiīīgangahanīīung,	*I may*	*not have been continually ill.*
Dung "	*Thou mayst*	
Il "	*He may*	
Ītil "	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Il stiīīgangahangwang,	*They may*	

PURE CONJUNCTIVE MOOD ?

Present Tense.

Dī stiīē lāīung,	*I should*	*be ill.*
Dung " "	*Thou shouldst*	
Il " "	*He should*	
Ītil " "	*We should*	
Dalung " "	*Ye should*	
Ltha " "	*They should*	
Il " louwang,	*They should*	

Present Progressive Tense.

Dī stiīē lāīunīung,	*I should*	*be continually ill.*
Dung " "	*Thou shouldst*	
Il " "	*He should*	
Ītil " "	*We should*	
Dalung " "	*Ye should*	
Ltha " "	*They should*	
Il " lāīungwang,	*They should*	

Perfect Tense.

Dī stiīē lāīini,	*I should*	*have been ill.*
Dung " "	*Thou shouldst*	
Il " "	*He should*	
Ītil " "	*We should*	
Dalung " "	*Ye should*	
Ltha " "	*They should*	
Il " lāwini	*They should*	

Perfect Progressive Tense.

Dī stiīē lāīun,	*I should*	*have been continually ill.*
Dung " "	*Thou shouldst*	
Il " "	*He should*	
Ītil " "	*We should*	
Dalung " "	*Ye should*	
Ltha " "	*They should*	
Il " louīun,	*They should*	

Conditional Conjunctive Mood.

Present Tense.

Di stītlingāgung,	*I would*	*be ill.*
Dung "	*Thou wouldst*	
Il "	*He would*	
Ĭtil "	*We would*	
Dalung "	*Ye would*	
Ltha "	*They would*	
Il stītlingāwang,	*They would*	

Present Progressive Tense.

Dī stītlingāgungung,	*I would*	*be continually ill.*
Dung "	*Thou wouldst*	
Il "	*He would*	
Ĭtil "	*We would*	
Dalung "	*Ye would*	
Ltha "	*They would*	
Il stītlingāgungwang,	*They would*	

Imperfect Tense.

Dī stīgēan	*I might*	*be ill.*
Dung "	*Thou mightest*	
Il "	*He might*	
Ĭtil "	*We might*	
Dalung "	*Ye might*	
Ltha "	*They might*	
Il stiwēan,	*They might*	

Perfect Tense.

Dī stītlingāgīni,	*I would*	*have been ill.*
Dung "	*Thou wouldst*	
Il "	*He would*	
Ĭtil "	*We would*	
Dalung "	*Ye would*	
Ltha "	*They would*	
Il stītlingwogīni,	*They would*	

Perfect Progressive Tense.

Dī stītlingagun,	*I would*	*have been continually ill.*
Dung "	*Thou wouldst*	
Il "	*He would*	
Ĭtil "	*We would*	
Dalung "	*Ye would*	
Ltha "	*They would*	
Il stītlingwogun,	*They would*	

INFINITIVE MOOD.

Present,	Stigē,	*Ill.*
Present Progressive,	Stigīgē,	*Being ill.*
Perfect,	Stigunē,	*Having been ill.*
Perfect Progressive,	Stigīgunē,	*Having been continually ill.*

PARTICIPLES.

Present,	Stis,	*Being ill.*
Present Progressive,	Stigīgīni,	*Being continually ill.*
Perfect,	Stiguni,	*Having been ill.*

G. CONJUGATION OF AN IRREGULAR VERB.

Irregular verbs are those which form the plural from a stem changed from their true stem by the addition of various letters or syllables. Sometimes the plural form is entirely different from the singular. I have selected the verb *kāgē*, "to walk" as an example. This in the plural form changes to *istalgē*. I shall only conjugate the active voice, as the passive of all verbs is seldom used amongst the Haidas.

Conjugation V.

INDICATIVE MOOD.

Present Tense.

Tlaou kāgung,	*I walk.*
Dahou "	*Thou walkest.*
Laou "	*He walks.*
Talung istalgung,	*We walk.*
Dalung "	*Ye walk.*
Ltha "	*They walk.*
Laou istalwang,	*They walk.*

Present Progressive Tense.

Tlaou kāgungung,	*I am*	*walking.*
Dahou "	*Thou art*	
Laou "	*He is*	
Talung istalgungung,	*We are*	
Dalung "	*Ye are*	
Ltha "	*They are*	
Laou istalgungwang	*They are*	

Past Tense.

Tlaou kāguni,	*I walked.*
Dahou "	*Thou walkedst.*
Laou "	*He walked.*
Talung istalguni,	*We walked.*
Dalung "	*Ye walked.*
Ltha "	*They walked.*
Laou istalwuni,	*They walked.*

Past Progressive Tense.

Tlaou kāgīgīni,	*I was*	*walking.*
Dahou "	*Thou wast*	
Laou "	*He was*	
Talung istalgīgīni,	*We were*	
Dalung "	*Ye were*	
Ltha "	*They were*	
Laou istalwogīgīni,	*They were*	

Perfect Tense.

Tlaou kāgīni,	*I have*	*walked.*
Dahou "	*Thou hast*	
Laou "	*He has*	
Talung istalgīni,	*We have*	
Dalung "	*Ye have*	
Ltha "	*They have*	
Laou istalwogīni,	*They have*	

Perfect Progressive Tense.

Tlaou kāgun,	*I have*	*been walking.*
Dahou "	*Thou hast*	
Laou "	*He has*	
Talung istalgun,	*We have*	
Dalung "	*Ye have*	
Ltha "	*They have*	
Laou istalougun,	*They have*	

Pluperfect Tense.

Tlaou kāgīgungwau,	*I had*	*walked.*
Dahou "	*Thou hadst*	
Laou "	*He had*	
Talung istalgīgungwau,	*We had*	
Dalung "	*Ye had*	
Ltha "	*They had*	
Laou istalwogīgungwau,	*They had*	

Pluperfect Progressive Tense.

Tlaou kāgīgungung,	*I had*	*been walking.*
Dahou "	*Thou hadst*	
Laou "	*He had*	
Talung istalgīgungung,	*We had*	
Dalung "	*Ye had*	
Ltha "	*They had*	
Laou istalwogīgungung,	*They had*	

Future Tense.

Tlaou kāsang,	*I shall*	
Dahou "	*Thou wilt*	
Laou "	*He will*	
Talung istalasang,	*We shall*	*walk.*
Dalung "	*Ye will*	
Ltha "	*They will*	
Laou istalwāsang,	*They will*	

Future Imperfect Tense.

Tlaou kāgungsang,	*I shall*	
Dahou "	*Thou wilt*	
Laou "	*He will*	
Talung istalgungsang,	*We shall*	*be walking.*
Dalung "	*Ye will*	
Ltha "	*They will*	
Laou istalgungwāsang	*They will*	

Future Perfect Tense.

Tlaou kāgungungsang,	*I shall*	
Dahou "	*Thou wilt*	
Laou "	*He will*	
Talung istalgungangsang,	*We shall*	*have walked.*
Dalung "	*Ye will*	
Ltha "	*They will*	
Laou istalgungwangsang,	*They will*	

Future Perfect Progressive Tense.

Tlaou kāgīgungsang,	*I shall*	
Dahou "	*Thou wilt*	
Laou "	*He will*	
Talung istalgīgungsang,	*We shall*	*have been walking.*
Dalung "	*Ye will*	
Ltha "	*They will*	
Laou istalgīgungwāsang,	*They will*	

INTENTIONAL FORM.

Present Tense.

Tlaou kāungkasang,	*I am*	
Dahou "	*Thou art*	
Laou "	*He is*	
Talung istalungkasang,	*We are*	*about to walk.*
Dalung "	*Ye are*	
Ltha "	*They are*	
Laou istalouungkasang,	*They are*	

Imperfect Tense.

Tlaou kātalgung,	*I am*	
Dahou "	*Thou art*	
Laou "	*He is*	
Talung istaltalgung,	*We are*	*going to walk.*
Dalung "	*Ye are*	
Ltha "	*They are*	
Laou istaltalwang,	*They are*	

Past Tense.

Tlaou kāungkaḡīḡīni,	*I was*	
Dahou "	*Thou wast*	
Laou "	*He was*	
Talung istalungkaḡīḡīni,	*We were*	*about to walk.*
Dalung "	*Ye were*	
Ltha "	*They were*	
Laou istalungkaḡīwīni,	*They were*	

Future Tense.

Tlaou kāḡīungkasang,	*I shall*	
Dahou "	*Thou will*	
Laou "	*He will*	
Talung istalgīungkasang,	*We shall*	*be about to walk.*
Dalung "	*Ye will*	
Ltha "	*They will*	
Laou istalgīungkawāsang,	*They will*	

IMPERATIVE MOOD.

Tlaou kāadzing,	*Let me walk.*
Kāaltha,	*Walk thou.*
Laou kāadzing,	*Let him walk.*
Talung istaldzing,	*Let us walk.*
Istalūithā,	*Walk ye.*
Ltha istaldzing,	*Let them walk*
Laou istalwōdzing,	*Let them walk.*

Present Progressive Tense.

Tlaou kāḡīadzing,	*Let me*	
Kāḡīaltha,	*Let thou*	
Laou kāḡīadzing,	*Let him*	
Talung istalgīadzing,	*Let us*	*be walking.*
Istalgīūltha.	*Let ye*	
Ltha istalgīadzing,	*Let them*	
Laou istalwōḡīadzing,	*Let them*	

Past Tense.

Tlaou kāgang,	*I walked.*	
Dahou "	*Thou walkedst.*	
Laou "	*He walked.*	
Talung istālang,	*We walked.*	
Dalung "	*Ye walked.*	
Ltha "	*They walked.*	
Laou istalouang,	*They walked.*	

Pluperfect Tense.

Tlaou kāgangang,	*I had*	
Dahou "	*Thou hadst*	
Laou "	*He had*	
Talung istalgangang,	*We had*	*walked.*
Dalung "	*Ye had*	
Ltha "	*They had*	
Laou istalwāgangang,	*They had*	

FORM DENOTING A WISH OR DESIRE.

Present Tense.

Tlaou kāgē da kwudungung,	*I wish*	
Dahou " " "	*Thou wishest*	
Laou " " "	*He wishes*	
Talung istalgē da "	*We wish*	*to walk.*
Dalung " " "	*Ye wish*	
Ltha " " "	*They wish*	
Laou " " kwudungwang,	*They wish*	

Past Tense.

Tlaou kāgē da kwudunguni,	*I wished*	
Dahou " " "	*Thou wishedst*	
Laou " " "	*He wished*	
Talung istalgē da "	*We wished*	*to walk.*
Dalung " " "	*Ye wished*	
Ltha " " "	*They wished*	
Laou " " kwudungwuni,	*They wished*	

Future Tense.

Tlaou kāgē da kwudungsang,	*I shall*	
Dahou " " "	*Thou wilt*	
Laou " " "	*He will*	
Talung istalgē da "	*We shall*	*wish to walk.*
Dalung " " "	*Ye will*	
Ltha " " "	*They will*	
Laou " " kwudungwāsang,	*They will*	

Subjunctive Mood.

Present Tense.

Tlaou	kāstlo,	*If I walk.*
Dahou	"	*If thou walkest.*
Laou	"	*If he walk.*
Talung	istalstlo,	*If we walk.*
Dalung	"	*If ye walk.*
Ltha	"	*If they walk.*
Laou	istalwāstlo,	*If they walk.*

Present Progressive Tense.

Tlaou	kāg̃ungstlo,	*If I be*	
Dahou	"	*If thou art*	
Laou	"	*If he be*	
Talung	istalgungstlo,	*If we are*	*walking.*
Dalung	"	*If ye are*	
Ltha	"	*If they are*	
Laou	istalgungwāstlo,	*If they are*	

Past Tense.

Tlaou	kāg̃angstlo,	*If I walked.*
Dahou	"	*If thou walkedst.*
Laou	"	*If he walked.*
Talung	istālang̃stlo,	*If we walked.*
Dalung	"	*If ye walked.*
Ltha	"	*If they walked.*
Laou	istalouangstlo,	*If they walked.*

Past Progressive Tense.

Tlaou	kāg̃īg̃anastlo,	*If I were*	
Dahou	"	*If thou wert*	
Laou	"	*If he were*	
Talung	istalgīg̃anastlo,	*If we were*	*walking.*
Dalung	"	*If ye were*	
Ltha	"	*If they were*	
Laou	istalgīwanastlo,	*If they were*	

Perfect Tense.

Tlaou	kāg̃īg̃astlo,	*If I have*	
Dahou	"	*If thou hast*	
Laou	"	*If he has*	
Talung	istalgīg̃astlo,	*If we have*	*walked.*
Dalung	"	*If ye have*	
Ltha	"	*If they have*	
Laou	istalgīwastlo,	*If they have*	

Perfect Progressive Tense.

Tlaou	kāḡanasītlo,	*If I have*	*been walking.*
Dahou	"	*If thou hast*	
Laou	"	*If he has*	
Talung	istalganasītlo,	*If we have*	
Dalung	"	*If ye have*	
Ltha	"	*If they have*	
Laou	istalganwasītlo,	*If they have*	

Pluperfect Tense.

Tlaou	kāḡīḡasītlo,	*If I had*	*walked.*
Dahou	"	*If thou hadst*	
Laou	"	*If he had*	
Talung	istalgīḡasītlo,	*If we had*	
Dalung	"	*If ye had*	
Ltha	"	*If they had*	
Laou	istalgīwāsītlo,	*If they had*	

Pluperfect Progressive Tense.

Tlaou	kāḡīḡungastlo,	*If I had*	*been walking.*
Dahou	"	*If thou hadst*	
Laou	"	*If he had*	
Talung	istalgīḡungastlo,	*If we had*	
Dalung	"	*If ye had*	
Ltha	"	*If they had*	
Laou	istalgīḡungwāstlo,	*If they had*	

Future Tense.

Tlaou	kāsēstlo,	*If I shall*	*walk.*
Dahou	"	*If thou wilt*	
Laou	"	*If he will*	
Talung	istalsēstlo,	*If we shall*	
Dalung	"	*If ye will*	
Ltha	"	*If they will*	
Laou	istalwāsēstlo,	*If they will*	

Future Progressive Tense.

Tlaou	kāḡīḡungsēstlo,	*If I shall*	*be walking.*
Dahou	"	*If thou wilt*	
Laou	"	*If he will*	
Talung	istalgīḡungsēstlo,	*If we shall*	
Dalung	"	*If ye will*	
Ltha	"	*If they will*	
Laou	istalgīḡungwāsēstlo,	*If they will*	

Future Perfect Tense.

Tlaou kāgungasēstlo,	*If I shall*	*have walked.*
Dahou "	*If thou wilt*	
Laou "	*If he will*	
Talung istalgungasēstlo,	*If we shall*	
Dalung "	*If ye will*	
Ltha "	*If they will*	
Laou istalgungwāsēstlo,	*If they will*	

Future Perfect Progressive Tense.

Tlaou kāgungungasēstlo,	*If I shall*	*have been walking.*
Dahou "	*If thou wilt*	
Laou "	*If he will*	
Talung istalgungungasēstlo,	*If we shall*	
Dalung "	*If ye will*	
Ltha "	*If they will*	
Laou istalgungungwāsēstlo	*If they will*	

POTENTIAL MOOD.

Present Tense.

Tlaou kāhangung,	*I may*	or *can walk.*
Dahou "	*Thou mayst*	
Laou "	*He may*	
Talung istalhangung,	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Laou istalouhangung,	*They may*	

Present Progressive Tense.

Tlaou kāgunghangung,	*I may*	or *can be walking.*
Dahou "	*Thou mayst*	
Laou "	*He may*	
Talung istalgunghangung,	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Laou istalougunghangung,	*They may*	

Past and Future Tenses.

Tlaou kāhasingung,	*I may*	*walk.*
Dahou "	*Thou mayst*	
Laou "	*He may*	
Talung istalhasingung,	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Laou istalouhasingung,	*They may*	

Past and Future Progressive Tenses.

Tlaou kāgīhasingung,	*I may*	*be continually walking.*
Dahou "	*Thou mayst*	
Laou "	*He may*	
Talung istalgīhasingung,	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Laou istalgīouhasingung	*They may*	

Perfect Tense.

Tlacu kāgangahangung,	*I may*	*have walked.*
Dahou "	*Thou mayst*	
Laou "	*He may*	
Talung istalgangahangung,	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Laou istalougangahangnng,	*They may*	

Perfect Progressive Tense.

Tlaou kāgīgangahangung,	*I may*	*have been walking.*
Dahou "	*Thou mayst*	
Laou "	*He may*	
Talung istalgīgangahangung,	*We may*	
Dalung "	*Ye may*	
Ltha "	*They may*	
Laou istalgīougangahangung,	*They may*	

PURE CONJUNCTIVE MOOD.

Present Tense.

Tlaou kāgē lāgung,	*I should*	*walk.*
Dahou " "	*Thou shouldst*	
Laou " "	*He should*	
Talung istalgē "	*We should*	
Dalung " "	*Ye should*	
Ltha " "	*They should*	
Laou " louwang,	*They should*	

Present Progressive Tense.

Tlaou kāgē lāgungung,	*I should*	*be walking.*
Dahou " "	*Thou shouldst*	
Laou " "	*He should*	
Talung istalgē "	*We should*	
Dalung " "	*Ye should*	
Ltha " "	*They should*	
Laou " lāgungwang,	*They should*	

Perfect Tense.

Tlaou	kāgē lāgīni,	*I should*	*have walked.*
Dahou	" "	*Thou shouldst*	
Laou	" "	*He should*	
Talung	istalgē "	*We should*	
Dalung	" "	*Ye should*	
Ltha	" "	*They should*	
Laou	" lougīni,	*They should*	

Perfect Progressive Tense.

Tlaou	kāgē lāgun,	*I should*	*have been walking.*
Dahou	" "	*Thou shouldst*	
Laou	" "	*He should*	
Talung	istalgē "	*We should*	
Dalung	" "	*Ye should*	
Ltha	" "	*They should*	
Laou	" lougūn,	*They should*	

CONDITIONAL CONJUNCTIVE MOOD.

Present Tense.

Tlaou	kātlingāgung,	*I would*	*walk.*
Dahou	"	*Thou wouldst*	
Laou	"	*He would*	
Talung	istaltlingāgung,	*We would*	
Dalung	"	*Ye would*	
Ltha	"	*They would*	
Laou	istaltlingougūng,	*They would*	

Present Progressive Tense.

Tlaou	kātlingāgungung,	*I would*	*be walking.*
Dahou	"	*Thou wouldst*	
Laou	"	*He would*	
Talung	istaltlingāgungung,	*We would*	
Dalung	"	*Ye would*	
Ltha	"	*They would*	
Laou	istaltlingwōgungung,	*They would*	

Imperfect Tense.

Tlaou	kāgēan,	*I might*	*walk.*
Dahou	"	*Thou mightst*	
Laou	"	*He might*	
Talung	istalgēan,	*We might*	
Dalung	"	*Ye might*	
Ltha	"	*They might*	
Laou	istalouēan,	*They might*	

Perfect Tense.

Tlaou	kātlingāgīni,	*I would*	*have walked.*
Dahou	"	*Thou wouldst*	
Laou	"	*He would*	
Talung	istaltlingāgīni,	*We would*	
Dalung	"	*Ye would*	
Ltha	"	*They would*	
Laou	istaltlingwōgīni,	*They would*	

Perfect Progressive Tense.

Tlaou	kātlingāgun,	*I would*	*have been walking.*
Dahou	"	*Thou wouldst*	
Laou	"	*He would*	
Talung	istaltlingāgun,	*We would*	
Dalung	"	*Ye would*	
Ltha	"	*They would*	
Laou	istaltlingwōgun,	*They would*	

INFINITIVE MOOD.

	SINGULAR.	PLURAL.	
Present,	Kāgē,	Istalgē,	*To walk.*
Present Progressive,	Kāgīgē,	Istalgīgē,	*To be walking.*
Perfect,	Kāgunē,	Istalgunē,	*To have walked.*
Perfect Progressive,	Kāgīgunē,	Istalgīgunē,	*To have been walking.*

PARTICIPLES.

	SINGULAR.	PLURAL.	
Present,	Kās,	Istalas,	*Walking.*
Present Progressive,	Kāgīgīnī,	Istalgīgīni,	*Having been walking.*
Perfect,	Kāguni,	Istalguni,	*Having walked.*

H. EXAMPLES OF PRINCIPAL TENSES OF THE MOST IMPORTANT VERBS.

1

Tlaou dāngung,	*I*	*throw away.*
Tlaou dāngsang,	*I shall*	
Tlaou dānghangung,	*I may*	
Tlaou dāngstlo,	*If I*	

2

Ga dī istatlang,	*I*	*want.*
Ga dī istatlāsang,	*I shall*	
Ga dī istatlahangung,	*I may*	
Ga dī istatlastlo,	*If I*	

3

Tlaou giālāgung,	*I*	*carry.*
Tlaou giālāsang,	*I shall*	
Tlaou giālāhangung,	*I may*	
Tlaou giālāstlo,	*If I*	

4

Tlaou gūshūgung,	*I*	*speak.*
Tlaou gūshūasang,	*I shall*	
Tlaou gūshūhangung,	*I may*	
Tlaou gūshūstlo,	*If I*	

5

Tlaou halkaiitang,	*I*	*lead.*
Tlaou halkaiitshang,	*I shall*	
Tlaou halkaiithangung,	*I may*	
Tlaou halkaiitstlo,	*If I*	

6

Tlaou hutlang,	*I*	*drink.*
Tlaou hutlāshang,	*I shall*	
Tlaou hutlāhangung,	*I may*	
Tlaou hutlāstlo,	*If I*	

7

Tlaou istang,	*I*	*take.*
Tlaou istāshang,	*I shall*	
Tlaou istahangung,	*I may*	
Tlaou istastlo,	*If I*	

8

Dī itlagidāgung,	*I am*	*chief.*
Dī ītlagidāsang,	*I shall be*	
Dī ītlagidāhangung,	*I may be*	
Dī ītlagidastlo,	*If I be*	

9

Tlaou kagindung,	*I*	*save.*
Tlaou kagindāsang,	*I shall*	
Tlaou kagindahangung,	*I may*	
Tlaou kagindastlo,	*If I*	

10

Tlaou kaiitang,	*I*	*go.*
Tlaou kaiitsang,	*I shall*	
Tlaou kaiithangung,	*I may*	
Tlaou kaiitstlo,	*If I*	

11

Tlaou kātlūgung,	*I*	*arise.*
Tlaou kātlūasang,	*I shall*	
Tlaou kātlūhangung,	*I may*	
Tlaou kātlūstlo,	*If I*	

12

Tlaou kiang,	*I*	*find.*
Tlaou kiāsang,	*I shall*	
Tlaou kiāhangung,	*I may*	
Tlaou kīastlo,	*If I*	

13

Tlaou kilthkadungung,	*I*	*lie.*
Tlaou kilthkadungsang,	*I shall*	
Tlaou kilthkadunghangung,	*I may*	
Tlaou kilthkadungstlo,	*If I*	

14

Tlaou kingung,	*I*	*see.*
Tlaou kingasang,	*I shall*	
Tlaou kinghangung,	*I may*	
Tlaou kingstlo,	*If I*	

15

Dī kintlingāgung,	*I am*	*rich.*
Dī kintlingāsang,	*I shall be*	
Dī kintlingahangung,	*I may be*	
Dī kintlingastlo,	*If I be*	

16

Tlaou kīsalgung,	*I*	*fast.*
Tlaou kīsalshang,	*I shall*	
Tlaou kīsalhangung,	*I may*	
Tlaou kīsalstlo,	*If I*	

17

Tlaou kouwang,	*I*	*sit.*
Tlaou kouwāsang.	*I shall*	
Tlaou kouwahangung,	*I may*	
Tlaou kouwastlo,	*If I*	

18

Tlaou kwaiundang,	*I*	*count.*
Tlaou kwaiundāsang,	*I shall*	
Tlaou kwaiundahangung,	*I may*	
Tlaou kwaiundastlo,	*If I*	

19

Tlaou kwolthtang,	*I*	*steal.*
Tlaou kwolthtāsang,	*I shall*	
Tlaou kwolthtāhanḡung,	*I may*	
Tlaou kwolthtāstlo,	*If I*	

20–21

Tlaou kwudunḡung,	*I*	*hear.*
Tlaou kwudungsang,	*I shall*	
Tlaou kwudunghanḡung,	*I may*	
Tlaou kwudungstlo,	*If I*	

22

Tlaou kwulthilthgung,	*I*	*think.*
Tlaou kwulthilthsang,	*I shall*	
Tlaou kwulthilthhanḡung,	*I may*	
Tlaou kwulthilthstlo,	*If I*	

23

Tlaou lthāangwilang,	*I*	*work.*
Tlaou lthāangwilāsang,	*I shall*	
Tlaou lthāangwilhanḡung,	*I may*	
Tlaou lthāangwilastlo,	*If I*	

24

Tlaou ltha ga istang,	*I*	*give.*
Tlaou ltha ga istahang,	*I shall*	
Tlaou ltha ga istahang,	*I may*	
Tlaou ltha ga istastlo,	*If I*	

25

Dī lthwauḡung,	*I*	*fear.*
Dī lthwauḡāsang,	*I shall*	
Dī lthwauḡāhanḡung,	*I may*	
Dī lthwauḡastlo,	*If I*	

26

Tlaou nānḡung,	*I*	*play.*
Tlaou nāngsang,	*I shall*	
Tlaou nānghanḡung,	*I may*	
Tlaou nāngstlo,	*If I*	

27

Tlaou saalgung,	*I*	*hide.*
Tlaou saalasang,	*I shall*	
Tlaou saalahanḡung,	*I may*	
Tlaou saalstlo,	*If I*	

28

Tlaou sahailthgung,	*I*	*cry.*
Tlaou sahailthsang,	*I shall*	
Tlaou sahailthhanḡung,	*I may*	
Tlaou sahailthstlo,	*If I*	

29

Tlaou saouḡung,	*I*	*pay.*
Tlaou saouasang,	*I shall*	
Tlaou saouhanḡung,	*I may*	
Tlaou saoustlo,	*If I*	

30

Tlaou shūḡung,	*I*	*say.*
Tlaou shūasang,	*I shall*	
Tlaou shūhanḡung,	*I may*	
Tlaou shūstlo,	*If I*	

31

Tlaou skadadang,	*I*	*teach.*
Tlaou skadadāsang,	*I shall*	
Tlaou skadadahanḡung,	*I may*	
Tlaou skadadastlo,	*If I*	

32

Tlaou tāḡung,	*I*	*eat.*
Tlaou tāasang,	*I shall*	
Tlaou tāhanḡung,	*I may*	
Tlaou tastlo,	*If I*	

33

Dī tagwiāḡung,	*I am*	*strong.*
Dī tagwiāsang,	*I shall be*	
Dī tagwiāhanḡung,	*I may be*	
Dī tagwiāstlo,	*If I be*	

34

Tlaou tatlāēdung,	*I*	*help.*
Tlaou tatlātasang,	*I shall*	
Tlaou tatlāēdhanḡung,	*I may*	
Tlaou tatlātstlo,	*If I*	

35

Tlaou tatlidzang,	*I*	*sow.*
Tlaou tatlidzāshang,	*I shall*	
Tlaou tatlidzahanḡung,	*I may*	
Tlaou tatlidzastlo,	*If I*	

36

Tlaou tīang,	*I*	*kill.*
Tlaou tīāsang,	*I shall*	
Tlaou tīāhanḡung,	*I may*	
Tlaou tīstlo	*If I*	

37

Tlaou tlaoutlang,	*I*	*make.*
Tlaou tlaoutlāsang,	*I shall*	
Tlaou tlaoutlahanḡung,	*I may*	
Tlaou tlaoutlastlo,	*If I*	

38

Tlaou tumankinḡung,	*I*	*take care.*
Tlaou tumankingasang,	*I shall*	
Tlaou tumankinghanḡung,	*I may*	
Tlaou tumankingstlo,	*If I*	

39

Tlaou yetang,	*I*	*believe.*
Tlaou yetāsang,	*I shall*	
Tlaou yetāhanḡung,	*I may*	
Tlaou yetastlo,	*If I*	

40

Tlaou washtkīshūḡung,	*I*	*clean.*
Tlaou washtkīshūasang,	*I shall*	
Tlaou washtkīshūhanḡung,	*I may*	
Tlaou washtkīshūstlo,	*If I*	

41

Tlaou wastdaaskītung,	*I*	*close.*
Tlaou wastdaaskitasang,	*I shall*	
Tlaou wastdaaskithanḡung,	*I may*	
Tlaou wastdaaskitstlo,	*If I*	

42

Tlaou wastdaastlang,	*I*	*open.*
Tlaou wastdaastlāsang,	*I shall*	
Tlaou wastdaastlahanḡung,	*I may*	
Tlaou wastdaaststlo,	*If I*	

I. IRREGULAR VERBS.

First Person Singular.

Tlaou kaiitang,	*I go.*
Tlaou tlidzgustland,	*I bind up wounds.*
Tlaou kāgung,	*I walk.*
Tlaou giatlindagwanḡung,	*I spread the news.*
Tlaou tligwanan aidung,	*I run about.*
Tlaou aidung,	*I run.*
Tlaou kāgwālang,	*I go outside.*
Tlaou sīk kātlang,	*I climb.*
Tlaou kāyāang,	*I walk straight.*
Tlaou giastlang,	*I pour out.*
Tlaou katsang,	*I enter.*
Tlaou kattīgung,	*I sleep.*
Tlaou ltha alth aidung,	*I run with.*
Tlaou nagung,	*I dwell.*
Tlaou hutlang,	*I drink.*
Tlaou tlū kaiitang,	*I depart by canoe.*
Tlaou hustang,	*I break.*
Tlaou tahustang,	*I crack.*
Tlaou kukākwudung,	*I crack with teeth.*
Tlaou ta*k*houkwudunḡung,	*I crack an egg.*
Tlaou tīdang,	*I lie down.*
Tlaou kuntlināgung,	*I sit on the ground.*
Tlaou chān ga kāgung,	*I wade in the sea.*
Tlaou kīang,	*I choose.*
Tlaou gihalaidung,	*I run to carry news.*
Tlaou giānḡung,	*I stand.*
Tlaou giāḡung,	*I stop.*
Tlaou gluīdzang,	*I fall into.*
Tlaou tātlitīching,	*I embrace.*
Tlaou hal-kāgung,	*I load.*
Tlaou kil kaiitang,	*I send.*
Tlaou tigung,	*I kill.*
Tlaou sahailthlang,	*I cry.*
Tlaou tlidalthtang,	*I fall down.*
Tlaou isantigung,	*I am poor.*
Tlaou kouwang,	*I sit.*
Tlaou tlistalthang,	*I lift up on my knees.*
Tlaou yhitgwanḡung,	*I fly.*
Tlaou tligunḡwanḡung,	*I swim.*
Tlaou agung dalthitlang,	*I hide myself.*
Tlaou gluandang,	*I lie down.*
Tlaou kwulungkatsing alth kouwang,	*I kneel.*
Dī gluīdzanḡ,	*I fall into.*
Dī kwōtālgung,	*I die.*
Dī hūtlidzūlanḡung,	*I am blown about.*

First Person Plural.

Talung istiēdang,	*We go.*
Talung tlidzādung,	*We bind up wounds.*
Talung istalgung,	*We walk.*
Talung giatlindachadunḡung,	*We spread the news.*
Talung hūdjanḡung,	*We run about.*
Talung *k*hūstang,	*We run.*
Talung issāgung,	*We go outside.*
Talung istalthāgung,	*We climb.*
Talung istalyāang,	*We walk straight.*
Talung giadūḡung,	*We pour out.*
Talung istzang,	*We enter.*
Talung kaslang,	*We sleep.*
Talung *k*hūdjanḡung,	*We run together.*
Talung naangung,	*We dwell.*
Talung nīlgung,	*We drink.*
Talung ostang,	*We depart by canoe.*
Talung tlahudjanḡung,	*We break.*
Talung tahudjanḡung,	*We crack.*
Talung ta*kh*ouhudjanḡung,	*We crack an egg.*
Talung tīslang,	*We lie down.*
Talung tikungawanḡung,	*We sit on the ground.*
Talung chān ga istalgung,	*We wade in the sea.*
Talung kingstang,	*We choose.*
Talung gihal*kh*ūstang,	*We run to carry news.*
Talung tlazūgianḡung,	*We stand.*
Talung tlazūgiāḡung,	*We stop.*
Talung houwītzang,	*We fell into.*
Talung tlahatīching,	*We embrace.*
Talung halistalgung,	*We lead.*
Talung kil istiēdang,	*We send.*
Talung tlitang,	*We kill.*
Talung sahaigung,	*We cry.*
Talung hunwīgung,	*We fall down.*
Talung isantislang,	*We are poor.*
Talung tluadang,	*We sit.*
Talung hastālthang,	*We lift up on our knees.*
Talung ungādalgung,	*We fly.*
Talung gunḡunḡwanḡung,	*We swim.*
Talung agung tahalthtlang,	*We hide ourselves.*
Talung gluanslang,	*We lie down.*
Talung kwulungkatsing alth kaouslang,	*We kneel*
Ītil houwītzang,	*We fall into.*
Ītil kwōtalthkang,	*We die.*
Ītil hūt . . zūlanḡung,	*We are blown about.*

J. VERBS CLASSIFIED BY MEANING.

1. Transitive Verbs.

Lā lth kwoyādung,	*I love him.*	Lā il skwuntlang,	*He kisses him.*
Lā il kwoyādung,	*He loves him.*	Tlaou ū tāgung,	*I eat it.*
Lā lth kinḡung,	*I see him.*	Laou ū tāgung,	*He eats it.*
Lā il kinḡung,	*He sees him.*	Lā alth lth nagung,	*I live with him.*
Lā telga lth kinḡung,	*I hate him.*	Lā alth il nagunḡ,	*He lives with him.*
Lā telga il kinḡung,	*He hates him.*	Lā lth kwudunḡung,	*I listen to him.*
Lā lth skwuntlang,	*I kiss him.*	Lā il kwudunḡung,	*He listens to him.*

2. Intransitive Verbs.

Tlaou gūshūgung,	*I speak.*	Dī yūanḡung,	*I am great.*
Laou gūshūgung,	*He speaks.*	Laou yūanḡung,	*He is great.*
Tlaou kwulthilthgung,	*I meditate.*	Tlaou kāgwālang,	*I go out.*
Laou kwulthilthgung,	*He meditates.*	Laou kāgwālang,	*He goes out.*
Dī kwutungēstigung,	*I am sad.*	Tlaou tīdang,	*I lie down.*
Laou kwutungēstigung,	*He is sad.*	Laou tīdang,	*He lies down.*
Tlaou tlidalthtang,	*I fall.*	Dī stigung,	*I am sick.*
Laou tlidalthtang,	*He falls.*	Laou stigung,	*He is sick.*

3. Verbal Propositions.

1.

Tlaou dunḡīīdung,	*I hoist flag as a sail.*
Tlaou kaaiyougung,	*I " boots as a sail.*
Tlaou tluyougung,	*I " trousers as a sail.*
Tlaou wēgidzūgung,	*I " an ordinary sail.*
Tlaou chiyougung,	*I " coat as a sail.*

2.

Tlaou dunghastung,	*I haul out.*
Tlaou dungitīdung,	*I " canoe.*
Tlaou dunglthkidalgung,	*I " logs.*
Tlaou dungwaununḡlīīgung,	*I " a net.*
Tlaou dungchaougelgung,	*I " on the beach.*

3.

Tlaou gialāgung,	*I carry.*
Tlaou sisgung,	*I " water.*
Tlaou skūlthgaūdung,	*I " on shoulders.*
Tlaou chīidung,	*I " a coat.*
Tlaou wunchigunḡung,	*I " a bundle.*
Tlaou ziskīdung,	*I " with tongs.*
Tlaou wunagung,	*I " on back.*
Tlaou sitzē tligunḡung,	*I " a sword.*
Tlaou siskaiīdung,	*I " sugar with tongs.*
Tlaou chiāgung,	*I " water from the well.*
Tlaou chiku skalgunḡung,	*I " a gun.*
Tlaou dūtlādelgung,	*I " up.*
Tlaou dūgung,	*I " wood.*

Tlaou giatlindaḡwanḡung,	*I carry news.*
Tlaou ginggang skwotlisgīdung,	*I " in my arms.*
Tlaou glīidung,	*I " arms.*
Tlaou haiīdung,	*I " once.*
Tlaou hakgunḡung,	*I " many times.*
Tlaou kwauaidung,	*I " on my head.*
Tlaou kwoisigunḡung,	*I " in my mouth.*

4.

Tlaou dungnēlthgwaigung,	*I tear to pieces.*
Tlaou dungulthgwaigung,	*I " a coat.*
Tlaou dungizitgung,	*I " into shreds.*
Tlaou ēdunanunḡung,	*I " paper* or *linen.*
Tlaou ēhananunḡung,	*I " clothes.*
Tlaou ēkwunanunḡung,	*I " with teeth.*
Tlaou skidīdung,	*I " in two.*
Tlaou aikwauēdistlang,	*I " into strips.*

5.

Tlaou tlahustang,	*I break.*
Tlaou aitlahadēdung,	*I " my word.*
Tlaou gilk takunḡung,	*I " biscuits.*
Tlaou skidīdung,	*I " in two.*
Tlaou tlahadēdung,	*I " my promise.*
Tlaou tlakūgung,	*I " to pieces.*
Tlaou tlakunḡung,	*I " bread into pieces.*
Tlaou tlatumīching,	*I " so as to destroy.*
Tlaou tlawhaunḡung,	*I " the body.*
Tlaou tilthwanḡung,	*I " " " with a whip.*
Tlaou kwan kwandung,	*I " stones with powder.*
Tlaou kwan tlahudjanḡung,	*I " stones.*
Tlaou skidustang,	*I " ground with pickaxe.*
Tlaou skitgoḡung,	*I " legs.*
Tlaou skōkwutuljanḡung,	*I " through.*
Tlaou tahuslāng,	*I crack.*

6.

Tlaou wasūgung,	*I gamble for clothes.*
Tlaou kādsdang,	*I " with cards.*
Tlaou sindaḡung,	*I " " sticks.*
Tlaou dālā alth shindang,	*I " " money.*

7.

Tlaou chissītung,	*I am fat.*
Dī īchitzūḡung,	*I " very fat.*
Dī īdumzūḡung,	*I " short and fat.*
Dī īkētzūḡung,	*I " tall and fat.*
Dī īkwutzūḡung,	*I " very tall and fat.*
Dī īlthkitzūḡung,	*I " tall and very fat*
Dī īlthkutzūḡung,	*I " fairly stout.*
Dī iskamzūḡung,	*I " tall and lean.*
Dī iskatzūḡung,	*I " lean.*
Dī istluzūḡung,	*I " stout and tall.*

8.

Tlaou tlū gwau ltha alth gu talthlīgung,	*I race by canoe.*
Tlaou ltha alth gu yhitīdung,	*I " on foot.*
Tlaou kuitan gwau ltha alth gu talthlīgung,	*I " on horseback.*

9.

Tlaou statilthdou unga hastlang,	*I put on both of my stockings.*
Tlaou statilthdou unga istlang,	*I " one of my stockings.*
Tlaou lthkitgā unga chistlang,	*I " my dress.*
Tlaou tatjingē unga gwustlang,	*I " my hat.*
Tlaou kodets unga katsang,	*I " coat.*
Tlaou kodets kātli unga chistlang,	*I " shirt.*
Tlaou āsitīching,	*I " a coat.*
Tlaou staskoḡa unga hastlang,	*I " both of my boots.*
Tlaou staskoḡa unga istlang,	*I " one of my boots.*
Tlaou collar unga istlang,	*I " my collar.*
Tlaou *h*ēl ēskātlināgung,	*I " something round on my neck.*

10

Tlaou hangjangwē ākatiswaugung,	*I jump through a window.*
Tlaou hangjangwē ēkingwaugung,	*I look " "*
Tlaou hangjangwē ēhustawaugung,	*I pour " "*
Tlaou hangjangwē ēkāgulthāgung,	*I go " "*
Tlaou hangjangwē gwi kātlang,	*I climb " "*
Tlaou nē stāhā gluīdalgung,	*I fall from a house.*

NOTE.—The word *hangjangwē* may or may not be used,

11

Ā lth hatlang,	*I jump into (water).*
Ā dī gluwaiang,	*I fall " "*
Ā dī hupidgang,	*I drop " "*
Tlaou shā stāhā hupidtalgung,	*I drop from a height.*
Tlaou shā stāhā ākatistalgung,	*I jump " "*
Tlaou shā stāhā kāalgung,	*I go " "*
Dī shā stāhā gluwidalgung,	*I fall " "*

12

Sīk lth ākouitlang,	*I jump up.*
Sīk lth kātlang,	*I go "*
Sīk lth istang,	*I put "*
Sīk lth kātilthtlang,	*I throw "*

13

Lth tlitwulgung,	*I put it in (a box)*
Wē lth giastlang,	*I pour it in.*
Washt lth istang,	*I take it out of* (refers to things only).
Stāha lth istang,	*I take it out of* (refers to persons only).

14

Shuīt lth kāgung,	*I walk among.*
Shuīt lth kingung,	*I look* "
Shuīt lth saalgung,	*I hide* "
Shuīt lth tlikwudungung,	*I feel* "

15

Addu lth kāgung,	*I walk round.*
Addu lth aidung,	*I run* "
Addu lth yhitgwangung,	*I fly* "
Addu lth ginung,	*I paddle* "
Addu lth tligungwangung,	*I swim* "

Examples.

Sel hōtē ai ltha istagun,	*They put it (the body) in the coffin.*
Washt dī istada,	*Let me pull it out.*
Laou kātlāgang waigen ītil shu il nagang,	*He came and dwelt among us.*
Dalung shuīt kum kin alth kaginsh kāng gaangung,	*There is no salvation among you.*
Kais addu talung tlu kāgun,	*We have been round the island by canoe.*

(4.) VERBS OF CONTACT (*Inku*).

Wau inku īching,	*On it.*
Inku īching,	*On it.*
Sīhinē inku lth katsang,	*I nail on to.*
Tablegē inku gioungwē īching,	*The sail is on the table.*
Kēlthka douwē inku īching,	*On a shelf.*

(5.) VERBS OF FEELING (*Kwutungē*).

Dī kwutungē lāgung,	*I am happy,*	lit.	" *A good heart.*"
Dī kwutungē glaiang,	*I have peace,*	lit.	" *A calm heart.*"
Dī kwutungē dāungang,	*I am unhappy,*	lit.	" *An evil heart.*"
Dī kwutungē stigung,	*I am sorry,*	lit.	" *A sick heart.*"
Dī kwutungē tlakwīdistlang,	*I am troubled.*		
Dī kwutungē tlikagulāgung,	*I rejoice.*		
Dī kwutungē sahailthlang,	*I mourn.*		

(6.) VERBS OF GRADATION.

Waug agung kaskīt denotes that the action is in progress and incomplete.

Dī inastlagē	waug agung kaskītung,	*I increase in years.*
Kiagin dālā sougē	" " "	*My money decreases.*
Tlaou kāgē	" " "	*I am still going to.*
Tlaou kaoungungē	" " "	*I am still walking along.*
Laou ginungē	" " "	*He is paddling along.*
Laou kāgē	" " "	*He continues his journey.*
Jinē koustiē	" " "	*The sun is getting warmer.*
Singē kwaunalē waug agung tahuskītung,		*The days are getting shorter.*
Singē jingalē waug agung tahuskītung,		*The days are getting longer.*

(7.) Verbs of Location.

(*a.*) *With* Annā, *In Doors.*

Annā lth kouwang,	*I sit in doors.*
Annā lth kattang,	*I sleep in doors.*
Annā lth hāēlthtang,	*I fight in doors.*
Annā lth gūshūgung,	*I talk in doors.*
Annā dī kātliyildungung,	*I am angry in doors.*

(*b.*) *With* Kiā, *Out of Doors.*

Kiā lth kouwang,	*I sit out of doors.*
Kiā lth kattang,	*I sleep out of doors.*
Kiā lth hāēlthtang,	*I fight out of doors.*
Kiā lth gūshūgung,	*I talk out of doors.*
Kiā dī kātliyildungung,	*I am angry out of doors.*

(*c.*) *With* Katti, *On the Beach.*

Katti lth kouwang,	*I sit on the beach.*
Katti lth kattang,	*I sleep on the beach.*
Katti lth hāēlthtang,	*I fight on the beach.*
Katti lth gūshūgung,	*I talk on the beach.*
Katti dī kātliyildungung,	*I am angry on the beach.*

(*d.*) *With* Tlūgwau, *On board a Vessel.*

Tlūgwau lth kouwang,	*I sit on board a vessel.*
Tlūgwau lth kattang,	*I sleep on board a vessel.*
Tlūgwau lth hāēlthtang,	*I fight on board a vessel.*
Tlūgwau lth gūshūgung,	*I talk on board a vessel.*
Tlūgwau dī kātlīyildungung,	*I am angry on board a vessel.*

Anything round, as a Ball.

Skaouda,	*On the floor.*
Skatis,	*On a dish.*
Skatlthinda,	*On a shelf.*
Skatlthindang,	*On a table.*

Things generally.

Annā,	*In the house.*
Ītliāgung,	*On the table.*
Skatlangwē ā,	*In crockery.*

Anything long, as a Stick or Gun.

Annā skāgutwang,	*Standing indoors.*
Annā skaoudang,	*Lying indoors.*
Annā isiwang,	*Hanging up indoors.*
Annā istlindang,	*On a table indoors.*
Kouwē inku,	*On the floor.*
Gatādinē inku,	*On the table.*
Skatlang ai,	*In a cup.*
Annā kēisiougung,	*Hanging up indoors.*
Annā saaiougung,	*Tinware hanging up indoors.*
Kiā kigīougung,	*Hanging up out of doors.*

Examples.

Kitlano kiagin skuskādzouwē īching?	*Where is my ball?*
Tablegē inku skatlthindang,	*It is on the table.*
Kitlano kiagin chiku īching?	*Where is my gun?*
Annā isiwang,	*It is hanging up in doors.*
Kitlano kiagin taskgē īching?	*Where is my walking stick?*
Kiā skaoudang,	*It is lying outside.*
Kitlano chinē īching?	*Where is the salmon?*
Kouwē inku īching,	*It is on the floor.*
Kitlano hānē īching?	*Where are the berries?*
Skatlangwē ai īching,	*They are in the cup.*
Kitlano gioungwē īching?	*Where is the sail?*
Kiā kigīougung.	*It is hanging up out of doors.*

(8.) Verb to Fall.

Kāgang refers to trees only.

Kīt kāgang,	*The tree falls.*
Kīt kāasang,	*The tree will fall.*
Kīt kāhangūng,	*The tree may fall.*
Kīt kāasingūng,	*The tree might have fallen.*
Kit nē gwi kāgang,	*The tree falls on a house.*
Kīt lthken gwi kāgang,	*The tree falls on a log.*
Kīt katti ga kāasang,	*The tree will fall on the beach.*
Kīt tligē gwi kāgang,	*The tree falls on the ground.*
Kīt nē gwi kāasang,	*The tree will fall on the house,*
Kīt lthken gwi kāasang,	*The tree will fall on a log.*
Kīt lthkan gwi kāhāngūng,	*The tree may fall on a log.*

(9.) Possessive Verbs.

(*Daang* denotes possession.)

Nē.	*House.*	Kiutan,	*Horse.*
Nē lth daang,	*I have a house.*	Kiutan lth daang,	*I have a horse.*
Tatjingē,	*Hat.*	Staskoōga,	*Shoes.*
Tatjingē lth dāang,	*I have a hat.*	Staskoōga lth daang;	*I have shoes.*
Kōgīna,	*Book.*	Chā,	*Wife.*
Kōgīna lth daang,	*I have a book.*	Chā lth daang,	*I have a wife.*

Nā gu dung dā us?	*Have you a horse?*
Chā gu dung dā us?	*Have you a wife?*
Statilthdou gu dung dā us?	*Have you stockings?*
Yātz gu dung dā us?	*Have you a knife?*
Kalka gu dung dā us?	*Have you a bottle?*
Dahou gu kit kai us?	*Have you a child?*
Gatou gu dung dā us?	*Have you a fork?*

Dāagung is always the answer in the affirmative as :—

Nē lth dāagūng,	*I have a house.*
Yātz lth dāagūng,	*I have a knife.*
Staskogā lth dāagūng,	*I have shoes.*
Gatou lth dāagūng,	*I have a fork.*
Dālā lth dāagūng,	*I have money.*
Kōgīna lth dāagūng,	*I have a book.*

(10.) Attempting Verbs.

Sinslāng, to attempt. These verbs denote the ability to accomplish the action expressed *e. g.*, to do what they wish to do.

Tlaou tlayhilgalē sinslang,	*I endeavour to dry.*
Tlaou tlalthtanel sinslang,	*I endeavour to soften.*
Tlaou kattis sinslang,	*I endeavour to sleep.*
Tlaou dak sinslang,	*I endeavour to buy.*
Tlaou king sinslang,	*I endeavour to look for.*
Tlaou kwoyāda sinslang,	*I endeavour to love.*

Examples.

Tlalthtanagē da dī kwudunḡung,	*I wish to soften.*
Tlayhilgalē da dī kwudunḡung,	*I wish to dry.*
Chā unga il kingāḡun,	*He has gone to look for his wife.*
Dung kāngē an talung istlāgun,	*We have come to see you.*
Kin dakgē da dī kwudunḡung,	*I wish to buy something.*
Hānlthē il dūḡung,	*He goes to get water.*

(12.) Pretending Verbs.

Kwaiēdung is generally affixed to the verbs : but others are used, as for instance the verb "to sleep" and "to die."

Tlaou kwoyād kwaiēdunḡung,	*I pretend to love.*
Tlaou lthāangwil,	*I pretend to work.*
Tlaou gūshou,	*I pretend to talk.*
Tlaou agung kin kagunāgung,	*I pretend to sleep.*
Tlaou agung istluanāndang,	*I pretend to die.*
Tlaou agung yētz hāadādang,	*I pretend to be a white man.*

(13.) Causing Verbs.

These verbs are made by the prefix *tla* and *kil*.

Lā lth tlakwulungēstigun,	*I made him sorry.*
Lā lth tlastigun,	*I made him sick.*
Lā lth tlakwotalgun,	*I made him die.*
Lā lth tlatagwiāgun,	*I made him strong.*
Lā lth tlahāagāgun,	*I made him weak.*
Lā lth tlanūngīstlagun,	*I made him well.*
Tlaou kil kaiitang,	*I cause to go.*
Tlaou il kwutungē kil stigung,	*I cause him to be sorry.*
Tlaou nē tlaoutlagun,	*I built a house.*
Lā lth kil kwoyādung,	*I made or caused him to love.*
Ītil il kil istiēdun,	*He caused or made us to go.*
Lā lth kil hāēlthtagun,	*I made him fight.*

(14.) Verbs Expressing Doubt.

Hangung and *Hasinḡung* are the two adverbs which are affixed to the verbs and denote doubt.

Annā il ishanḡung,	*He is perhaps in the house.*
Ou hāadē tlū istlāhanḡung,	*The Haidas are perhaps coming.*

Laou stiahanḡung,	*He is likely to be sick.*
Tlaou ishasinḡung,	*I suppose I shall go.*
Yētz hāadē kashāgahanḡung,	*Perhaps the whites are gone.*
Dung kilth kingān talung wauhasinḡung,	*Perhaps we shall obey you.*

(15.) COMMUNICATIVE OR RECIPROCAL VERBS.—*Gwu.*

Gwu da lth tlāto,	*Help each other.*
Gwu da lth skidungo,	*Strike each other.*
Gwu da lth kwoyādo,	*Love each other.*
Gwu telga lth kingo,	*Hate each other.*
Gwu lth zintlūo,	*Shoot each other.*
Gwu da lth hāēlthto,	*Fight each other.*
Gwu talung tatlātzing,	*Let us help each other.*
Gwu talung kwoyādzing,	*Let us love each other.*
Gwu telga talung kingzing,	*Let us hate each other.*
Gwu telga talung kinḡun,	*We hated each other.*
Gwu talung kwoyādogun,	*We loved each other.*
Gwu talung zintlūgun,	*We shot each other.*

(16.) DESIRING VERBS.—*Da kwudung.*

Hutliē da dī kwudunḡung,	*I desire to drink.*
Hutliē da dī kwudunḡun,	*I desired to drink.*
Kaltīgē da dī kwudunḡung,	*I desire to sleep.*
Lthāangwiliē da dī kwudunḡung,	*I desire to work.*
Kwoyādiē da dī kwudunḡung,	*I desire to love.*
Stigē da dī kwudunḡung,	*I desire to be sick.*
Lāgē da dī kwudunḡung,	*I desire to be good.*

(17.) VERBS THAT HAVE THEIR NOUN FORMED FROM THE ROOT OF THE VERB WITH *lē* OR *lēilung* AFFIXED.

Tlaou tuman kinḡung,	*I takecare.*
Tuman kinglē,	*A caretaker,*
Tlaou lamatoē kētsitang,	*I shepherd.*
Lamatoē kētsitlē,	*A shepherd.*
Tlaou lthāangwilang,	*I work.*
Lthāangwillē,	*A workman.*
Tlaou kwolthtāng,	*I steal.*
Kwolthtalē,	*A thief.*
Tlaou skadang,	*I learn.*
Skadālē,	*A scholar.*
Tlaou tlitāng,	*I kill.*
Tlitalē,	*A murderer.*

(18.) THESE NOUNS WITH THE VERB "*to be*" AFFIXED ARE THUS CONJUGATED.

Dīu tuman kinglē gāḡung,	*I am a caretaker.*
Dīu lamatoē kētsitlē gāḡung,	*I am a shepherd.*
Dīu lthāangwillē gāḡung,	*I am a workman.*
Dīu tlitlē gāḡung,	*I am a murderer.*
Dīu kwolthtalē gāḡung,	*I am a thief.*
Dīu skadālē gāḡung,	*I am a scholar.*

(19.) Adjectival Verbs.—(*ng* and *gung.*)

Tadang,	*It is cold.*	Kīnang,	*It is warm.*
Lthdīingāgung,	*It is deep.*	Althlang,	*It is wide.*
S'heltdung,	*It is red.*	Delāgung,	*It rains.*
Touāgung,	*It snows.*	Tatjūgung,	*It blows.*
Takalgung,	*It freezes.*		

(20.) Naming Verbs.

Kēya affixed to a noun is a verb meaning to name or call, as :

John hinū īl kēyang,	*He is called John.*
Killāt hāadē hin ltha kēyang,	*They are called Zimshians.*
Nungetlagidas hinū īl kēyang,	*He is called a chief.*
Jesus hinū il kēyang,	*His name is Jesus.*
Kasino adshi dung kēyang?	*What do you call this?*
Kasino il kēyang?	*What is his name?*

Additional Examples of Verbs.

First Person Singular.—*Tlaou, Lth, Dī.*

Tlaou kwoyādung,	*I love.*
Tlaou lthāangwilang,	*I work.*
Dī kwutūngē lāgun,	*I was happy.*
Dung an dī kātliyildungūng,	*I am angry with you.*
Dī gu dung kwoyāda us?	*Do you love me?*
Lā lth kingūni,	*I saw him.*
Dung telga lth kingūng,	*I hate you.*

Second Person Singular.—*Dung, Dahou, Tung.*

Dī toui dung īching,	*You are my friend.*
Tung ā lth killāgung,	*I thank you.*
Dahou gu is?	*Is it you?*
Gūsh gā dung istātlang?	*What do you want?*
Dahou dī an kwutungē lā us?	*Are you pleased with me?*

Third Person Singular.—*Laou, Il.*

Laou kwōtaltalgung,	*He is nearly dead.*
Hin lā il shūtaiang,	*He said unto him.*
Il kwutungēstigung,	*He is sorry.*
Lā ga il istaguni,	*He gave it to him.*
Laou dung telgu dāungang,	*He is worse than you.*
Laou ltha telgu kutūngāgung,	*He is wiser than they.*

First Person Plural.—*Talung, Ītil.*

Talung istiēdasang,	*We shall go.*
Ītil kwutungē tlakwīdistlthagung,	*We are in trouble.*
Lā talung kingasang,	*We shall see him.*
Dung kāngēanu talung istlāgun,	*We came to see you.*
Ītil wautliwan gūgung,	*We are all lost.*
Ītil stī odzūgung,	*We are all sick.*

Second Person Plural.—*Dalung.*

Dalung kōnunḡung,	*You are foolish.*
Dalung tagwiāgung,	*You are strong.*
Kingwoguns ē dalunḡ tlahadēdung,	*You break the commandments.*
Dalung ītil an kātliyildunḡung,	*You are angry with us.*
Dī telga dalung kinḡ hanḡung,	*You may hate me.*
Dī kwutungē dalung kil stigunḡung.	*You are making me sorry.*

Third Person Plural.—*Ltha*, *Il* or *Laou*, if a few.

Ādlun il istlāougung,	*They come here (a few).*
Ādlun ltha istlāgung,	*They come here.*
Dī tagwiastlo dī ltha kingasang,	*They will see me when I am strong.*
Laou ītil an kwutungē louwang	*They are pleased with us (a few).*
Lā il kil kaiitouang,	*They sent him away (a few).*
Laou dāunga yūan ougung,	*They are very wicked (a few).*

Examples of the Tenses.

Tlaou kinḡung,	*I see.*
Dung lth kwoyādaguni,	*I loved you.*
Ltha an dung lthāangwilāshang,	*You will work for them.*
Dung kānḡē da dī kwudung hanḡung,	*I may wish to see you.*
Tlaou kaiit ungkashang,	*I am about to go.*
Dung stistlo yhil dung ga lth istāshang,	*I will give you medicine when you are ill.*
Kētsit nē ai talung idjāni,	*We were in prison.*
Jesus ā singelthkang lth gūshū,	*Pray to Jesus.*
Lā telga lth king gīḡunḡun,	*I have been hating him.*
Zanoa tluwē kātlāgunḡung,	*The steamer is coming.*
Kum kin ga dung istatlāngsang,	*You will not want anything.*
Kashintlou ādlun dung īching?	*Why are you here.*
Lā dung kwoyādāsēstlo lāou tasang,	*If you love him he will be good.*
Tuman lth adshi king,	*Take care of this.*
Adātlth lā talung kinḡuni,	*We saw him yesterday.*
Il kānḡē da gu dung kwuyung us?	*Do you wish to see him?*
Lā an dī kātliyildunḡīni,	*I have been angry with him.*
Il stis hagunan ītil kwutungēstigung,	*We are sorry that he is sick.*
Laou kātlātālang ītil il kagindiēan,	*He came down that he might save us*
Lth hāada wautliwan hagunan il kwōtalang,	*He died for all mankind.*
Ga Prophetgas gē lth hāada kin skadadaḡangang,	*The Prophets had taught*, or *used to teach, the people.*
Gūsh gu dung istatlang?	*What do you want?*
Sugar dakgē da dī kwudunḡung,	*I wish to buy sugar.*
Kutla, dung an dī kwutungēstigung,	*Go, I am vexed with you.*
Kum dung kaiitānsken kiak dung lth istāshang,	*If you don't go I shall put you out.*
Ou hāadē an dī kwutungē lāḡung,	*I am pleased with the Haidas.*
Tān isken kwaun ishin dalung tlitiē da dī kwudunḡung,	*I wish you to kill bears and furseal.*
Hāēlthtiē gu dung kwudung us?	*Do you wish to fight?*
Kiutanē dalung kwolthtastlo kētsit nē ai dalung isisang,	*If you steal horses you will go to prison.*

Tlii tā ga dung dā us?	*Have you got a good canoe?*
Kāhano; kum tlu lā lth dāangūng,	*No, I have not got a good canoe.*
Hānē gu kwan us?	*Are there many berries?*
Ang, kwangūng,	*Yes, many.*
Bible an gu dalung ūnshit us?,	*Do you understand the Bible?*
Tliku Jesus shouan gu dalung yetā us?	*Do you believe what Jesus said?*
Dung kit gu sti us?	*Is your child sick?*
Zanoē dī an gu dung istā us?	*Will you get me firewood?*
Kasino dung ēdung aiata?	*How are you to-day?*
Adātlthstlo gu talung istiēdsā us?	*Shall we go to-morrow?*
Tou dī ga dung istā us?	*Will you give me food*
Askaskit kīslūgung?	*What time is it?*
Askaskit swaunshung wok hinawē āgung,	*It is half-past one.*
Lāgiē nē ā lth kaiit,	*Go to his house.*
Kitlano dalungiē tlūwē īching?	*Where are your canoes?*
Ītilgiē nē kladskāgung,	*Our house is strong.*
Adshi gu dalung istatla?	*Do you want this?*
Ashgē yenkienu lāgung,	*These are truly good.*
Tliku kālungē edsi han gu dalung istatlang?	*What size do you want?*
Gwu tālung kwoyādzing,	*Let us love each other.*
Agung lth saalgung,	*I hide myself.*
Kumwadshi kingānu edāngung,	*It is not like that.*
Staskoga dalānga kladskāgung,	*Your boots,* or *the boots for you, are strong.*

ROYAL SOCIETY OF CANADA

TRANSACTIONS

SECTION III.

MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

PAPERS FOR 1895

I.—*On some of the Advances in Mineralogical Chemistry.*

By B. J. HARRINGTON, M.A., Ph.D.

(Presidential address before Section III. of the Royal Society of Canada, delivered May 15, 1895.)

The subject of this address was suggested to me by my reading some of Klaproth's remarkable "Analytical Essays towards promoting the Chemical Knowledge of Mineral Substances," published early in the present century. While struck with the amount of details of patient investigation there recorded, the great advance which has been made in recent times, both as regards methods of work and interpretation of results, was by contrast brought prominently before me, and it seemed that I could not do better than call the attention of this section to a few points in connection with modern methods of research in mineralogical chemistry. I advisedly say a few points, because the whole field is far too wide to be traversed in one short address. Should the mathematical members of the section not enjoy the technicalities of the subject, I must remind them that my chemical formulæ are but a slight return for the mathematical hieroglyphics with which I have been tortured in years gone by.

Everyone will admit the importance of having pure materials for the purpose of analysis. If impure minerals are analysed, conclusions with regard to constitution, formula, etc., are of comparatively little value. Fortunately much attention is devoted to this question at the present time and great care used in the selection of material for analysis. In this work the microscope lends valuable aid, while the electro-magnet and liquids of high density are proving of very great service. The electro-magnet is chiefly used in the separation of certain constituents of rocks, but may also be employed in the purification of minerals for analysis. Magnetite can, of course, be readily removed from a mixed powder, but so also can various iron-bearing species, such as pyroxene, hornblende, olivine, garnet, etc. The readiness with which a mineral is attracted by an electro-magnet, is not, however, always proportional to the quantity of iron contained, and, as is well known, many minerals (biotite and chromite for example) are less readily attracted than others which contain much less iron.[1]

The separation of minerals according to specific gravity may be accomplished by various mechanical means, but the methods employed so far seem to be susceptible of much improvement. Dafert and Derby have

[1] H. Rosenbusch, Mikroskopische Physiographie der petrographisch wichtigen Mineralien, 1885, p. 221.

described apparatus used by them for the purpose in the Proceedings of the Rochester Academy of Sciences. (Vol. ii., p. 122.)

Dense liquids are being more and more employed in the separation of minerals from mixed aggregates. Their use, of course, depends upon their being denser than some of the minerals in the aggregate and lighter than others, the heavy minerals sinking to the bottom of the liquid, and the light ones floating. By gradually diminishing the density of the liquid a series of separations can often be made. Obviously the liquid must be one which has no chemical action upon the minerals concerned. It should also be as mobile as possible if the particles are to settle readily, and should be easily recovered so as to be used again.

Among the dense liquids which have been employed is Thoulet's solution, an aqueous solution of potassium-mercuric iodide, whose maximum density is 3·196; Klein's solution (cadmium borotungstate) as ordinarily employed has a density of about 3·36, and, like Thoulet's, is miscible with water in all proportions, so that its density may be reduced to any desired point and the water afterwards removed by evaporation. Rohrbach's solution (barium-mercuric iodide) has a higher density (3·588) than the two last named, but has the serious disadvantage of undergoing decomposition on dilution with water. Methylene di-iodide[1] has proved useful in some cases. Its specific gravity at 16° C. is 3·3243, and this can be diminished by addition of benzole, but not of water or alcohol. The benzole can afterwards be removed by evaporation.

Certain salts in a fused condition have proved very satisfactory and have a much higher density than the liquids already described. Silver nitrate,[2] for example, fuses at about 198° C. to a clear mobile liquid of about 4·1 sp. gr., and the density can be diminished at will by the addition of potassium nitrate. The operation may be performed in a test-tube, which, along with a thermometer, is suspended in a small beaker by means of an asbestus card. The small beaker is in turn suspended in a larger beaker by means of another asbestus card and the whole heated on a sand tray or iron plate. On cooling the salts solidify to a mass with the lighter and heavier minerals at the top and bottom respectively. The test-tube is broken away from the fusion, the parts of the latter containing the minerals cut or broken off and the nitrates removed by solution in water. Of course, here, as in other cases, it is necessary that the salts should not act upon the minerals and that the latter should not suffer decomposition on account of the temperature at which the experiment is performed (225°-250° C.). This method, I may remark, has in some cases given me excellent results.

Where available the double nitrate of thallium and silver (also sug-

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[1] Suggested by R. Brauns, Jahr. f. Min, 1886, ii., 72.

[2] Suggested by Dr. J. W. Retgers, Jahrb. f. Min, 1889, ii., p. 190.

gested by Retgers [1]) will be found to be an admirable medium for the purpose in question. The double salt fuses at 75° C. and in the fused state is clear and mobile and has a specific gravity of 5. A great advantage here, too, is that the density may be lowered by the addition of water and the salt regained by evaporation.

In the separation of minerals for the purposes of analysis advantage is frequently taken of the fact that certain solvents may attack some of the constituents of a mixture and not attack others, or perhaps only dissolve them very slowly. Some species, such as zircon, rutile and andalusite, for example, resist the action of hydrofluoric acid (or HF with HCl or H_2SO_4), while others readily pass into solution. Woodward long ago took advantage of this fact in estimating the zirconia in certain crystalline rocks,[2] and more recently, by this means, several chemists have succeeded in isolating rutile from slates.

Certain sulphides such as pyrrohotite, stibnite, sphalerite and bornite, are, according to Bolton, readily attacked by citric acid, while pyrite, chalcopyrite, chalcocite and many other sulphides resist the action of that acid. The removal of carbonates, by means of dilute acids, from minerals previous to analysis scarcely requires comment here.

While it is not my intention to go into minute details with regard to the analysis of minerals, there are a few questions in this connection to which I wish to refer. In the analysis of silicates, chemists are too frequently content with determining the total iron and then calculating it as ferrous or ferric oxide as the case seems to demand ; but in any important analysis the proportions of the two oxides, if both are present, should be carefully determined. Without such determinations it is impossible in many cases to draw any satisfactory conclusions with regard to the constitution and formula of the mineral. An impression seems to prevail that the estimation of ferrous iron in insoluble silicates is a difficult matter, while in fact the operation is usually simple and rapidly performed. Tolerably accurate determinations may be made by decomposing the silicate with hydrofluoric and sulphuric acids in a platinum crucible without the employment of carbon dioxide, heating with a small flame.[3]

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[1] Jahrb. f. Min, 1893, i. p. 90. The double salt may be prepared by bringing together the two nitrates in the proportion of one molecule of each. Thallium nitrate is easily made by dissolving thallium in nitric acid.

[2] Rept. of the Geological Exploration of the Fortieth Parallel, vol. ii., 1877—Descriptive Geology, by Clarence King, p. 397.

[3] By this method I have sometimes obtained higher results than by heating over the water-bath in an atmosphere of CO_2. The higher results were no doubt due to more perfect decomposition of the silicate. In one case a mineral yielded 21·05 per cent of ferrous oxide, using CO_2 and the water-bath, and 21·97 p. c. over the flame without CO_2.

Working in this way, Mr. J. H. Pratt obtained the following results, employing ferrous sulphate:[1]

Time.	FeO taken.	FeO found.	Error.
10 minutes	·0843	·0825	·0018—
10 "	·0594	·0578	·0016—
10 "	·0739	·0728	·0011—

When very accurate determinations are desired Pratt recommends the use of a platinum crucible with perforated lid and platinum tube, arranged as the apparatus of H. Rose for the ignition of precipitates in hydrogen. Here the air can readily be displaced by carbon dioxide and the crucible heated directly over a small flame. By heating in this way the operation is much more rapid than when the water-bath is used, and the decomposition of difficultly attackable silicates much more easily accomplished. Pratt found in experiments with black tourmaline that nearly as much of the mineral was dissolved by boiling for ten minutes over a flame as by heating quietly for two hours over the water-bath.[2] In cases where the silicate is easily decomposed I have used a modification of the ordinary apparatus which is very convenient. The bottom is cut off from a three-necked Woulf's bottle, which is then stood in a beaker of slightly greater diameter than the bottle and containing a little water. The beaker is supported on a water-bath. Two of the necks of the bottle —provided with corks and tubes—are utilised for the ingress and egress of a stream of pure carbon dioxide, while the third is for the introduction of a platinum stirring rod which moves freely through a cork in the central neck and reaches to the bottom of the platinum crucible containing the mineral for analysis and supported by a small stand made of lead or other suitable material. With this apparatus there is, of course, no danger of oxidation and the contents of the crucible can be readily stirred from time to time—an advantage especially in cases where the mineral is liable to cake.

The estimation of water in minerals (more particularly silicates) is a matter which deserves careful attention, and careful determinations of this constituent will no doubt do much to elucidate the constitution of many imperfectly understood species. The loss which takes place when a silicate is ignited may include not only water (possibly hydroxyl) in different states of combination, but also carbon dioxide and fluorine; and in cases where much ferrous oxide is present any value which the determination may have is further diminished, more or less of the ferrous oxide being converted into ferric, so that in some cases there is a gain instead of loss on ignition, even when water and other volatile constituents are present.

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[1] Am. Jour. Sci., Aug., 1894.

[2] See also in this connection a paper by Chester and Cairns, Am. Jour. Sci., Aug. 1887.

The thanks of chemists and mineralogists are due to Professor Penfield, of Yale, for his recent and valuable paper "On Some Methods for the Determination of Water," which have proved useful in his hands.[1]

There is another question which is important more especially in connection with the analysis of crystalline rocks, and to which I have seen no reference in the text-books. The rocks often contain iron pyrites, and if no allowance is made for this in estimating the alkalies by Lawrence Smith's method, the results are entirely erroneous. In the fusion with calcium carbonate and ammoniun chloride, the sulphur of the pyrites becomes oxydised, and sulphates of the alkalies are produced along with the alkaline chlorides and weighed as chlorides. If one considers the difference in the molecular weights of the alkaline sulphates and chlorides it is obvious that the error introduced in this manner may be very serious. The difficulty may be obviated in different ways—in some cases by roasting the powdered mineral before making the fusion for alkalies, in others by removing the pyrites with nitric or nitro-hydrochloric acid ; or again, by entirely converting the alkalies into sulphates and weighing as such, or by transforming the sulphates into chlorides by one of the well-known methods.

Considerable attention has been devoted of late years to the examination of minerals for elements which in many cases have escaped detection, but there is room for a large amount of research in this direction. The importance of this line of work is accentuated by the recent discovery by Professors Ramsay and Crookes, who find that the gas contained in the mineral clèveite, a variety of uraninite, is a mixture of helium and argon with a little nitrogen. If we look at the early anaylses of uraninite we find no indication of any gaseous constituent (apart from the oxygen), but in 1890 Hillebrand (to whom we are indebted for most of our knowledge as to the chemical composition of uraninite)[2] showed that on fusing the mineral with an alkaline carbonate, or on treating it with a non-oxydising inorganic acid, a gas was liberated which appeared to agree in its properties with nitrogen. The discovery was regarded with much interest, because it was the first case in which nitrogen had been found in any mineral constituting the original crust of the earth. But now in the gas extracted from clèveite, Ramsay and Crookes recognise not only nitrogen but argon and helium, a hypothetical element of the solar spectrum.[3]

Other examples of the necessity of re-examining minerals whose composition was long ago supposed to have been settled, are to be found in the case of the scapolites, many of which were shown by Dr. Adams to

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[1] Am. Jour. Sci., July, 1894, p. 31.

[2] Am. Jour. Sci., Nov., 1890.

[3] The above is left as written. The fact that subsequent observations failed to confirm the presence of argon along with the helium in clèveite does not alter the argument.

contain chlorine, and in the case of beryl, which Penfield has shown to contain alkalies (soda, lithia and cæsia) replacing beryllia to the extent of from 0·25 per cent up to 5 per cent.

Thus far attention has been called mainly to questions in connection with the practical or laboratory side of mineral chemistry, but I wish also to say a few words with regard to some of the recent developments on the theoretical side. And here let me remark that there seems even to-day to be a vague impression in the minds of many that the chemistry of natural minerals is in some way distinct from that of bodies produced by artificial methods—an ill-defined idea that the laws regulating the production of chemical compounds in nature are somehow different from those with which the chemist has to deal in his laboratory.[1] I need scarcely say that this is a mistaken idea. The laws are the same in both cases, but the bodies formed in nature are often highly complex in their composition, involving special methods of investigation and affording problems of special character. The existence of a special department of mineralogical chemistry depends simply upon convenience.

Those who are familiar with the efforts that have been made to explain the chemical constitution of mineral species know with what great difficulties the path is beset. The methods of ascertaining chemical constitution and molecular weight made use of in the study of organic compounds are rarely available here, where as a rule we have to deal with non-volatile bodies and bodies which often resist the action of all ordinary solvents. Where chemical reagents have any marked effect the varying power of resistance to their action is valuable as pointing to differences of chemical or physical constitution. Experiments recently made seem to show that marcasite is more rapidly oxydised by potassium permanganate than pyrite.[2] Clarke, in his study of a number of magnesian minerals, found that on heating them for some time in hydrochloric acid gas, part of the magnesium was converted into soluble chloride, and drew certain conclusions as to the condition of the magnesium in the molecule, regarding the part dissolved as having been present in combination with hydroxyl as —Mg-OH. Whether his conclusions on this subject are always justifiable, some may doubt, but no one can fail to recognise the importance of many of his results, nor to feel that the line of work which he has taken up is in the right direction. The experiments of the late Mr. J. B. Mackintosh with regard to the resisting power of different silicates to the action of

[1] Berzelius insisted strongly upon minerals being regarded as chemical compounds whose composition was dependent upon the same laws as that of compounds artificially produced.

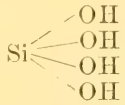
[2] The results obtained by Prof. Edgar F. Smith with the electric current are interesting in this connection. Smith found that a current which would completely oxydise the sulphur in marcasite in a given time would oxydise less than half of the sulphur in pyrite in the same time. (Jour. Franklin Inst., cxxx., pp. 152-154.)

hydrofluoric acid are also worthy of study by those interested in the question under consideration.

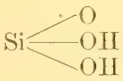
The different action of solvents upon different faces of crystals has long been recognised. Lavizzari, for example, observed in 1865 that on immersing calcite crystals in an acid, faces of like kind gave off the same quantity of carbon dioxide, but that the gas was evolved much more abundantly from the lateral than from the end faces of a hexagonal prism.[1] The investigations of Baumhauer and others have also shown that when a crystal is submitted for a short time to the action of a solvent capable of attacking it, the faces are not uniformly attacked, but are covered with little cavities of characteristic form. The cavities, which have been termed corrosion or etch-figures, are generally polyhedral in form and similarly orientated on the same face or on faces of like kind. Like the optical characters of a mineral, they point to a most intimate relationship between the internal structure and external form of crystals and sometimes afford a valuable means of detecting unsuspected merohedry.

The group of silicates is one affording many difficult and interesting problems in chemical constitution, to some of which attention may be called. The various members of the group have by some been regarded as compounds of metallic oxides with silica—enstatite, for example, as a compound of MgO with SiO_2, just as magnesium sulphate was once looked upon as a compound of MgO and SO_3. The view now generally accepted, however, is that they are salts of different silicic acids, either known or hypothetical. This is certainly the most rational way of looking at them, and even if we make assumptions as to one or more "hypothetical silicic acids," we do nothing that is not constantly done in the case of carbonic acid.

Of the silicic acids, the simplest are orthosilic and metasilicic, whose constitution may be represented thus:



ORTHOSILICIC ACID.



METASILICIC ACID.

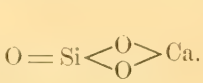
The latter, it may be observed, may be regarded as an anhydride of the first.

There is little doubt as to the existence of orthosilicic acid, though it does not seem to have been obtained in a perfectly pure state. A number of its compounds, with organic radicals (esters), have been prepared, and the vapour density in some cases determined. We have,

[1] Elements de Cristallographie physique. Soret. Genève, 1863, p. 222. In this connection see also an interesting paper by Meyer and Penfield on "Results obtained by etching a Sphere and Crystals of Quartz with Hydrofluoric Acid." Trans. Conn. Acad., vol. viii., 1889.

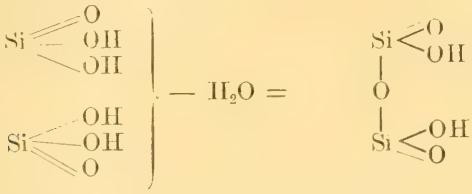
for example, methyl[1] and ethyl orthosilicates, formed by acting upon silicon tetrachloride with methyl and ethyl alcohol respectively. Ethyl metasilicate is also said to have been prepared. As simple examples of a natural orthosilicate and metasilicate, we may take chrysolite and wollastonite :

CHRYSOLITE.



WOLLASTONITE.

By the elimination of one molecule of water from two molecules of metasilicic acid we should expect to get meta-disilicic acid $H_2Si_2O_5$, thus :

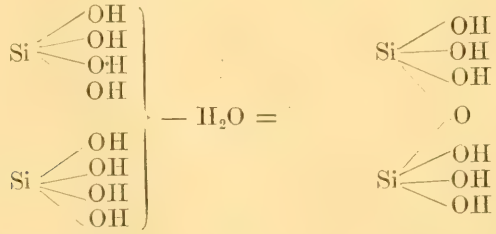


TWO MOLECULES METASILICIC ACID.

META-DISILICIC ACID.

A compound agreeing fairly well with this formula has been obtained by Merz (Jour. f. Pract. Chem., 99, 1771).[2] As an example of one of its salts, we may take the minerals petalite $LiAl(Si_2O_5)_2$ and titanite $CaSiTiO_5$.

By the abstraction of a molecule of water from two molecules of orthosilicic acid, the resulting acid would be ortho-disilicic $H_6Si_2O_7$, thus :



TWO MOLECULES ORTHOSILICIC ACID.

ORTHO-DISILICIC ACID.

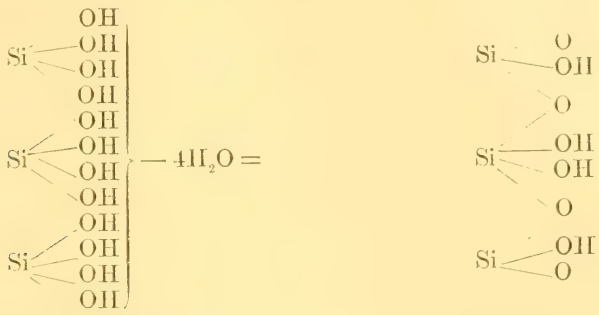
Though this acid has not been isolated, both its methyl and ethyl

[1] The vapour density of methyl orthosilicate is 5·38 (calc. 5·26).

[2] Merz found that the gelatinous compound formed by decomposing SiF_4 with water, after drying for six weeks in air at 20°–25° C., contained from 13·1 to 13·5 per cent of water. The formula $Si_2O_5H_2$ requires 13·05 per cent. Groth, however, states in his "Tabellarische Übersicht der Mineralien," p. 93, that the acid $Si_2O_5H_2$ is not known in the free condition.

esters have been prepared. According to Tschermak, serpentine is one of its salts, and may be represented by the formula $H_2(MgOH)_2MgSi_2O_7$. Other chemists, however, explain the constitution of this mineral differently. Clarke and Schneider, for example, regard it as an orthosilicate represented by the formula $H_3(MgOH)\ Mg_2(SiO_4)_2$.[1]

If, again, we consider four molecules of water eliminated from three molecules of orthosilicic acid, we obtain a polysilicic acid with the empirical formula $H_4Si_3O_8$, thus :



THREE MOLECULES OF ORTHOSILICIC ACID. ORTHO-TRISILICIC ACID.

A compound having approximately this composition was prepared by the late Prof. Fremy of Paris.[2] The polysilicates of Dana's mineralogy are supposed salts of this acid. Orthoclase feldspar may be regarded as an ortho-trisilicate, and according to this view its formula is $KAlSi_3O_8$.

The silicic acids which we have discussed are then :

(1) H_4SiO_4 Orthosilicic.
(2) H_2SiO_3 Metasilicic.
(3) $H_2Si_2O_5$ Meta-disilicic.
(4) $H_4Si_3O_8$ Ortho-trisilicic.
(5) $H_6Si_2O_7$ Ortho-disilicic.

There is good evidence as to the existence of the first two, and fairly strong evidence as to the existence of 3 and 4. An ester or ethereal salt, $(CH_3)_6Si_2O_7$, of No. 5 has been prepared. Certain silicates have also been referred to it, but their constitution is probably better explained in other ways. But even if we allow only four silicic acids it will be seen that the possibilities as regards variety of composition are very great ; for not only may there be both basic and acid salts of these

[1] Am. Jour. Sci., 40, 308, 1890.

[2] By decomposing potassium silicate solution by CO_2, or SiF_4 by water, and drying the gelatinous precipitates so formed *in vacuo*, Fremy obtained a hydrate containing 16·2 to 16·8 p.c. of water. The formula $H_4Si_3O_8$ requires 16·67 p.c.

acids, but we may, as in the case of the feldspar group, have molecular compounds in which molecules of different silicates replace one another isomorphously. Clark has shown that the variation in the composition of many silicates may be explained by regarding the different forms as derived from normal salts, certain constituents of which may be replaced by other atoms or molecular groups. The micas, for instance, he regards as derived from the normal salts $Al_4(SiO_4)_3$ and $Al_4(Si_3O_8)_3$. Rammelsberg also explains the constitution of many complex silicates, which cannot be referred to any of the simple types enumerated, by regarding them as compounds in varying proportions of orthosilicates and metasilicates, sometimes with disilicates, etc.

It is, of course, possible to assume the existence of a number of acids which have not yet been isolated, but the present tendency is rather to reduce the number of types. Groth indeed regards orthotrisilicic acid as composed of metasilicic and meta-disilicic acids, thus :

$$H_4Si_3O_8 = H_2SiO_3 + H_2Si_2O_5.$$

He has tried, too, wherever possible, to refer silicates to the two simplest acids—orthosilicic and metasilicic. Take, for instance, the case of andalusite, which was often described as a salt of hypothetical parasilicic acid (H_6SiO_5 or $SiO_2\ 3H_2O$), in accordance with which the formula would be Al_2SiO_5. Groth regards it as a basic orthosilicate containing the univalent group AlO, and writes the formula $(AlO)\ AlSiO_4$. Cyanite, again, which has precisely the same empirical formula as andalusite, he writes as a basic metasilicate $(AlO)_2\ SiO_3$, on the ground that cyanite is less liable to decomposition than andalusite and that metasilicates generally are more stable than orthosilicates.

Some chemists look with suspicion upon the attempts which are being made to assign constitutional formulæ to minerals, regarding the formulæ as based upon hypotheses and having no foundation of fact. This must arise largely from lack of knowledge as to what has been accomplished, and also from a certain unwillingness to apply the same principles to mineral chemistry as are applied to other departments of the science. Besides there is no science which has not been helped by working hypotheses and theories or by argument from analogy ; and without its numerous hypotheses, organic chemistry could never have made the marvellous strides that it has during the past forty or fifty years.

As an illustration of the thorough manner in which minerals are being investigated at the present day, let me here cite Professor S. L. Penfield's [1] recent study of the mineral topaz. This species had often been studied before, and had been analysed and re-analysed by many

[1] On the Chemical Composition and Related Physical Properties of Topaz, by S. L. Penfield and J. C. Minor, jr., Am. J. Sc., May, 1894, p. 387.

chemists. The analyses showed clearly that silicon and aluminium were present in the proportion of 1:2, but the percentage of fluorine ranged from 16·12 to 18·83. The formula that had generally been accepted for the mineral was that suggested by Groth $[Al(O.F_2)]AlSiO_4$. Penfield had, however, previously shown that hydroxyl frequently replaces fluorine in minerals, and it occurred to him that in the case of topaz the varying proportions of fluorine might be due to the presence of varying proportions of hydroxyl. Specimens of topaz from a number of localities were examined, and it was found that in every case water was given off on ignition, and further that the proportion varied inversely with the amount of fluorine. The legitimate conclusion drawn by Penfield was that the water was derived from hydroxyl and that in topaz there is an isomorphous replacement of fluorine by hydroxyl. In accordance with this view the simplest formula that can be assigned to the mineral is $[Al(F.OH)]SiO_4$. Penfield's admirable paper also brings out in a striking manner the close connection subsisting between the chemical composition and physical properties of topaz. There is a slight diminution in specific gravity corresponding to the increase of hydroxyl, and a corresponding increase in the optic axial angle. The indices of refraction also increase and the strength of the double refraction decreases in proportion as hydroxyl replaces fluorine.

Look, in the next place, at the case of talc, whose constitution has been carefully studied by Clarke and Schneider.[1] The percentage composition of a typical specimen was carefully determined, and it was found that scarcely any of the water was driven off at temperatures short of redness. On heating the mineral to from 383°—412° in an atmosphere of dry hydrochloric acid gas for fifteen hours, scarcely any effect was produced. Long continued treatment with aqueous hydrochloric acid produced little effect, also pointing to the stability of the compound. The empirical formula deducible from the analyses is the ordinary one $Mg_3H_2Si_4O_{12}$. The simplest interpretation as to constitution is that the compound is an acid metasilicate $Mg_3H_2(SiO_3)_4$. Groth, however, regarded the mineral as a basic salt of the disilicic acid $H_2Si_2O_5$—and gave it the formula $Mg(MgOH)_2(Si_2O_5)_2$. The question therefore which Clarke wished to settle was, which formula was most nearly in accord with the facts—should talc be regarded as an acid metasilicate or a basic meta-disilicate?

The study of a number of other silicates (as already noticed) seemed to indicate that the magnesia which is eliminated by the action of dry hydrochloric acid gas is present in the mineral in combination with hydroxyl (—Mg—OH.) If, therefore, talc were a basic silicate the hydrochloric acid should have a marked effect in eliminating magnesia; which

[1] Experimental Untersuchungen über de Constitution der natürlichen Silicate, von F. W. Clarke and E. H. Schneider in Washington. Zeitschrift für Krystallographie, etc., xviii., 4, 1890.

effect, as we have seen, is not produced. Further it was argued that if Groth's formula rightly represented the constitution of talc, then the mineral on heating would simply lose water and no liberation of silica would take place :—

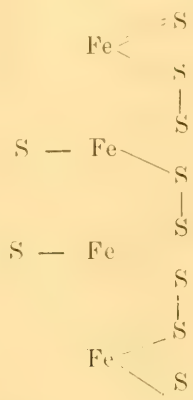
$$Mg\left<\begin{matrix}Si_2O_5 - Mg - OH\\ Si_2O_5 - Mg - OH\end{matrix}\right. = Mg\left<\begin{matrix}Si_2O_5 - Mg\\ Si_2O_5 - Mg\end{matrix}\right>O + H_2O$$

whereas, if the mineral were a metasilicate, the probability was that not only would water be given off, but silica set free, thus :

$$H_2Mg_3(SiO_3)_4 = 3MgSiO_3 + SiO_2 + H_2O.$$

On heating the mineral to a white heat for half an hour, and afterwards boiling the ignited product with soda solution, 15·36 per cent of silica actually went into solution—that is practically one-fourth of the silica in the mineral ($\frac{1}{4}$ = 15·57 per cent). Talc, on the other hand, which had not been previously ignited was found to be scarcely attacked by similar treatment with soda. Certainly Clarke seems to have been justified in concluding that talc is an acid metasilicate.

Another interesting example of the investigation of mineral constitution is to be found in Mr. Amos P. Brown's recent study of pyrite and marcasite.[1] Hitherto we have had no satisfactory explanation of the fact that marcasite undergoes decomposition so much more readily than pyrite ; but Mr. Brown explains this by showing that in marcasite all the iron is in the ferrous state, while in pyrite four-fifths of the iron exist in the ferric condition. The structural formula suggested for pyrite is accordingly,



while that of marcasite may be

or some polymer of this.

[1] A Comparative Study of the Chemical Behaviour of Pyrite and Marcasite, Proc. Am. Philosoph. Soc., xxxiii., no. 145.

The decomposition of the sulphide was in each case effected by heating the finely powdered mineral to 200° along with a ten per cent solution of copper sulphate in a sealed tube for six hours. At ordinary temperature and pressure the copper solution had little effect on either mineral, and the same was true when the solution was boiled. Under pressure, however, the decomposition was found to be complete, the sulphur combining with the copper to form copper sulphide and the iron passing into solution as sulphate.

In no branch of mineralogical chemistry has greater advance been made of late years than in the artificial production of minerals. With the exception of a few isolated attempts to produce artificial minerals, scientific work in this direction may be said to belong entirely to the present half of our century, and to have originated in the experiments of Ebelmen, who was for some time director of the porcelain manufactory at Sèvres, and who succeeded in producing the ruby, spinel and other minerals by artificial processes.

While much has been accomplished in other countries, more especially in Germany, the chief founders of the synthetic method in mineralogical chemistry have been Frenchmen. As evidence of this we have but to mention such names as those of Durocher, Daubrée, Senarmont, Debray, H. Saint-Claire Deville, Becquerel, Hautefeuille, Fremy, Fouqué, Michel-Levy, Friedel, Sarasin and Bourgeois. Several of these investigators are still the active exponents of what has been justly termed the *French School* in synthetic mineralogy.[1]

The methods employed in the synthetic production of minerals are varied in character, and in some cases are designed to imitate the processes supposed to be carried out in nature. The object, however, is to produce not simply a definite chemical compound, but as far as possible one exhibiting the crystalline form and physical characters belonging to the natural mineral. Some of the methods accordingly are designed to convert amorphous into crystalline bodies, while the object of others is the direct production of a crystalline mineral.

By way of illustration a few of the methods employed and the results obtained may be given. The conversion of amorphous into crystalline bodies is in some cases brought about by heating in gases which have no apparent chemical action upon them. Zinc sulphide, for example, becomes crystalline when heated in an atmosphere of nitrogen, and amorphous stannic oxide may be converted into beautifully crystalline cassiterite by heating in hydrochloric acid gas. In other cases the gas (or vapour) plays an obvious part in a chemical change, as when galena is produced by the action of hydrogen sulphide upon lead chloride,

$$PbCl_2 + H_2S = PbS + 2HCl.$$

[1] See McGowan's translation of E. von Meyer's "History of Chemistry," 1891, p. 475.

or as when rutile crystals are obtained by the action of water vapour upon volatile titanium chloride :

$$TiCl_4 + 2H_2O = TiO_2 + 4HCl.$$

In other cases crystalline minerals have been produced by the action of vapours upon non-volatile bodies. In this way Daubrée obtained spinel crystals—heating magnesia and aluminium chloride in vapour of water :

$$MgO + 2AlCl_3 + 3H_2O = MgAl_2O_4 + 6HCl.$$

If again certain chlorides are placed in a flask along with solution of sodium carbonate and the air displaced by hydrogen sulphide gas, crystals of corresponding sulphides or sulphosalts are gradually produced. In this way Doelter obtained pyrargyrite, stephanite, etc.

Among the most interesting results are those which have been obtained by heating various bodies in sealed tubes. By this method a number of zeolites have been produced, freshly prepared gelatinous silica being heated to 150° C. along with aluminium chloride, sodium carbonate and calcium carbonate (or $CaCl_2$). By the action of aluminium silicate upon potassium silicate, under high pressure and at a temperature of 550°, C. Friedel and Sarasin have obtained orthoclase. It has also been found that certain minerals after being finely pulverized can be re-crystallised by digesting in a sealed tube with carbonated water. In this way Doelter obtained crystals of stilbite, after heating for eleven days at 170° C. (also natrolite and scolecite at 160° C.).

Fusion processes have been extensively employed and have yielded many interesting results. Simple fusion in some cases renders bodies crystalline, as in the case of amorphous antimony sulphide, which is thus converted into stibnite. According to Gaudin, also, amorphous alumina may be fused in the oxyhydrogen flame and rendered crystalline.[1] More frequently, however, the addition of some flux such as boric acid or borax is necessary. Ebelmen, for example, obtained corundum by fusion of amorphous alumina in borax, and Bourgeois has prepared calcite by fusing calcium carbonate with calcium chloride.[2]

A number of artificial minerals have been produced by fusing together their essential constituents—silicates, for example, by fusing silica with various oxides or carbonates. In this way have resulted augite, leucite, nephelite, anorthite, meionite, etc. The temperature required is generally high (1200–1500°C. and over). Some flux is often employed, which may or may not take part in the chemical reaction. Commonly a metallic chloride (or fluoride) is used, and may supply one of the metals required.

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[1] Comp. rend. 1869, Bd. 69, 1342.

[2] Bull. Soc. Min. 1882, Bd. 5, p. 111.

A point of interest in connection with mineral synthesis is the variety of methods by which the same mineral can, in many cases, be produced. If geologists paid more attention to this question they would perhaps be less inclined to dogmatise with regard to the origin of mineral deposits than they have sometimes been in the past.

The above examples of methods of mineral synthesis are mainly from Doelter's "Allgemeine Chemische Mineralogie," Leipsic, 1890.

II.—*On the Estimation of Starch.*

By THOMAS MACFARLANE.

(Read May 15, 1895.)

To determine the quantity of starch contained in cereals, food products or feeding stuffs has always been regarded as a tedious and uncertain operation. Indeed, so much has this been the case that, in by far the greater number of analyses of these substances, the starch has not been estimated but is included in the percentage of non-nitrogenous extractive or carbo-hydrates. This figure is obtained by calculating the difference between 100 and the sum of the constituents directly determined; namely, water, proteids, fat, fibre and ash. This remark applies to the completest of the analyses collected together in König's "Chemische Zusammensetzung der menschlichen Nahrungs und Genussmittel," and to the work of Grandeau, Maercker, Clifford Richardson and many other investigators. These analyses embrace all cereals, leguminous fruits, oleaginous seeds, in short every grain and seed species which is used for food; flour and bread of every description, prepared flours, infants and invalids foods, tubers, roots, vegetables, etc.

The substances thus included in the term non-nitrogenous extractive or carbo-hydrates are quite considerable in number, but not by any means similar in properties. The terms mentioned may, but do not always, include starch, gums or pentosans, dextrine, cane sugar, grape sugar, pectin, lichenin, bitter principles and colouring matters. In order to get a correct estimation of the starch, most of the last named substances require to be previously removed which is always tedious and not always possible. The difficulties of the problem have been set forth by Professor Stone, in an article contributed to the Journal of the American Chemical Society (1894, p. 726) who, in introducing it, says: "There is no longer much "doubt among chemists that, in food analysis, the present practice of "classifying a large number of widely varying substances under the head "of non-nitrogenous extract matter, as a homogeneous material, is wholly "erroneous and misleading."

In the same article Professor Stone gives the experimental results of estimating the starch in a mixture of starch, sugar and dextrine, in cotton seed meal, wheat middlings, hay, wheat, bran, cornmeal, wheatflour, dried potato and pure potato starch. There were five different methods employed, all of which gave results closely agreeing in the case of the pure potato starch, but more or less discordant in the flours and feeding stuffs on account of the presence in these of some of the substances other than starch above mentioned. Except in the case of asbestus method the processes followed were based upon inversion by acids; the starch is con-

verted into dextrose, the acid neutralised by soda, and the solution either titrated by Fehling solution or polarised. After reviewing the results obtained Professor Stone says, "The most hopeful way of avoiding these "difficulties would seem to be some method of bringing the starch into "solution, and removing it from its accompanying carbo-hydrates with-"out any corresponding influence upon them. One method seems to "offer this advantage, viz., the application of diastase or malt infusion "to the starch containing material." Professor Stone shows that the malt infusion is without action on some of the other carbo-hydrates, and proposes after solution and separation from these to estimate the starch by inversion and titration.

The method which I propose for ascertaining the percentage of starch differs from that preferred by Professor Stone only in avoiding the latter processes, and the estimation is made by weighing before and after the action of the malt extract, the difference being regarded as the amount of starch removed.

The manner of carrying out this estimation is by means of crysotile fibre, which, as former papers have shown, has been found extremely useful in the operations of the Laboratory of the Inland Revenue Department. Its application in milk analysis was described by me before this section in May, 1887, and subsequently in December, 1892, I read a paper before the Society of Public Analysts in London (The Analyst, XVIII., 73) describing the use of crysotile fibre in the examination of butter, cheese, fats and oils, soaps, spirits and malt liquors, syrups, molasses and coffee. The latter article was the first in the examination of which it was found advantageous to envelop and diffuse it in crysotile fibre, while being acted on or extracted by various solvents. It was in the gradual development of the crysotile method that it occurred to me to attempt the treatment of wheat flour, and meals from other grains in a similar manner, removing their proximate constituents successively one after the other, and estimating their percentages by loss, in the same manner as is done in gas analysis. The succession of the solvents applied is mainly that long ago suggested by Willstein, and now prescribed by Dragendorff and others in the analysis of plants, and is given along with the constituents removed in the following statement:

AGENT OR SOLVENT USED.	CONSTITUENTS ESTIMATED.
1. Drying	Moisture
2. Petrolic ether	Fats and oils
3. Ethyl-ether	Resins, &c.
4. Alchol of sp. gr. 0·797	Sugars, &c.
5. Cold water	Gums and dextrine
6. Malt infusion	Starch
7. In the residue	Proteids, ash and fibre

(*Here explanations regarding the apparatus used were given.*)

This scheme of proximate organic analysis has not yet been worked out in all its details; indeed it will require much time and labour to do so, but the following results may be given for the purpose of showing the possibilities of the plan suggested:

	Moisture.	Fat.	Sugars, etc.	Gum and Dextrine.	Starch.	Residue Proteids, Ash and Fibre.
Wheat flour	12·48	0·	0·40	6·04	69·00	11·08
Oatmeal	8·60	3·16	6·32	3·96	56·12	21·84
Patent barley	11·72	0·	0·72	4·36	70·72	12·48
Peameal	12·88	0·	6·28	8·68	43·40	28·76
Indian cornmeal	9·96	0·	5·92	3·32	63·76	17·04
Ground rice	12·60	0·	0·00	3·84	70·04	13·52

These figures roughly approximate the composition of the foods in question, but they also show defects as regards the estimation of some of the constituents, especially the fat. This is accounted for by the circumstance that the drying was done in atmospheric air. The extraction by ethyl-ether was omitted. With reference to the starch, however, it will be seen that the figures approach pretty closely to the quantities which are usually supposed to exist in the flours in question.

Regarding the estimation of the starch, I may mention the following details: After the tubes and their contents have been treated with cold water, dried and weighed, they are placed, eight at a time, in a copper rack. The rack is placed in water (contained in an enamelled basin) reaching up to the top of the tubes, and moistening their contents. The water is then heated up to 85° C., and the tubes kept in it one hour, in order to effect the gelatinization of the starch. The water is then poured off and replaced by an infusion of malt containing three per cent of Parke, Davis & Co.'s Plain Malt Extract, and the digestion continued for several hours longer at a temperature varying from 65° to 80° F. The tubes are then removed from the rack and the hot filtered malt infusion passed through them. After this their contents are further washed with hot water until the filtrate shows no indication of the presence of starch by iodine solution. As much water as possible is then removed from them over the filter-pump, when they are dried and weighed, the decrease from the previous weighing being taken as starch.

It gives me much pleasure to be able to communicate the results obtained by Prof. E. B. Kenrick, one of our most talented official analysts, who undertook, at my request, to apply this new method to a series of samples of wheaten flour which had been collected in Manitoba

in the ordinary course of administering the Adulteration Act. No special instructions were given as regards the collection of these samples; they were simply obtained where they were offered for sale in Winnipeg and other towns of the province. The results of Prof. Kenrick's work are given in the following table:

RESULTS OF EXAMINING EIGHTEEN SAMPLES OF WHEATEN FLOUR, BY PROF. E. B. KENRICK.

No. of Sample.	Brand or Description of Flour.	Name of Manufacturer as given by Vendor.	Nitrogen.	Proteids.	Ash.	Moisture.	Alcohol Extract. Fat, Resins and Sugars.	Cold Water Extract. Gums and Dextrine.	Malt Infusion Extract. Starch.
14565	Ulster	Ogilvie Milling Co	2·82	17·63	2·08	8·3	11·5	3·5	53·9
68	National Bakers'	do do	2·71	16·94	1·46	9·3	10·6	3·2	56·5
64	XXXX	Lake of the Woods Milling Co	2·66	16·63	1·19	9·9	10·6	3·7	56·1
75		H. B. Mitchell, Millwood, Man	2·57	16·06	0·74	9·8	9·8	4·4	55·9
63	Algoma	Lake of the Woods Milling Co	2·24	14·00	0·83	10·2	9·1	4·2	56·9
62	Strong Bakers'	do do do	2·22	13·88	0·44	10·0	8·8	5·3	58·8
72	do	do do do	2·20	13·75	0·42	10·7	8·4	5·5	56·4
74		H. Rodgers, MacGregor, Man	2·07	12·94	0·40	10·6	7·8	5·0	63·0
69	Hungarian Patent	Hudson's Bay Co	2·03	12·69	0·41	9·7	7·6	4·6	63·5
67	Strong Bakers'	Ogilvie Milling Co	2·02	12·63	0·62	10·2	6·9	4·5	64·1
73	Hungarian Patent	do do	1·96	12·25	0·40	10·9	7·0	4·4	63·5
61	do do	Lake of the Woods Milling Co	1·89	11·81	0·35	10·4	7·0	4·1	63·7
77	do do	Ogilvie Milling Co	1·87	11·69	0·40	9·4	7·0	4·0	64·6
66	do do	do do	1·85	11·56	0·40	10·1	5·7	4·1	62·7
71	do do	Rutherford & Bruce	1.80	11·25	0·43	11·0	5·3	4·2	62·9
76	do do	Ogilvie Milling Co	1·70	10·63	0·36	9·7	5·3	4·9	63·2
70	Strong Bakers'	Rutherford & Bruce	1·67	10·44	0·35	11·8	5·8	4·9	61·5
78	Hungarian Patent	H. Rodgers, MacGregor, Man	1·67	10·44	0·40	9·3	5·7	5·3	64·3

The figures shown in the column headed "Malt Infusion Extract" are of considerable interest. The percentages are there given of the starch found in four samples of "Hungarian Patent Flour," manufactured by the Ogilvie Milling Company, but all collected in different localities. They are respectively 62·7, 63·2, 63·5 and 64·6, the greatest difference being 1·9 per cent. Four other samples of the same name but made by different millers gave 62·9, 63·5, 63·7 and 64·3, the greatest difference being 1·4 per cent. This is really a remarkable uniformity and calculated to inspire confidence in the correctness of the method. Two samples of "Strong Bakers," manufactured by the Lake of the Woods Milling Company but taken in different localities, gave 56·4 and 58·8 per cent starch respectively. Other samples of so-called "Strong Bakers" give 61·5 and 64·1 per cent, figures which lead to the suspicion that the proper name may not have been given of the brand at the time of the purchase.

A closer inspection of the table shows some interesting relations which are also confirmatory of the reliability of the process described in this paper. The samples examined are given in the order of their nitrogen contents, beginning with the one richest in that element. This order agrees fairly well with that of the ash, which generally diminishes with the decrease of the proteids. It is too much to expect at present perfectly definite relations between the other figures, but still it can be noticed that the alcoholic extract decreases in the same order as the nitrogen, while the water extract and starch generally increase as the nitrogen diminishes. Of course, there is still a great deal of investigation to be done in ascertaining the exact nature of the substances removed by the action of the solvents, such as alcohol and water, but on the whole I think it will be admitted that the work given in this table, by an independent manipulator, goes to show that the method of starch examination which I have brought before the section is not unworthy the attention of those chemists who have devoted themselves to the study of food analysis.

III.—*Note on Secondary Undulations recorded by self-registering Tide Gauges; and on Exceptional Tides in relation to Wind and Barometer.*

By W. BELL DAWSON, MA.E., ASSOC. M. INST. C.E.

(Presented by Dr. Johnson, May 15, 1895.)

In carrying on the Tidal Survey for the Department of Marine, the writer would desire to draw attention to the secondary undulations which are met with, as a matter of scientific interest. These undulations are registered by more than one of the recording tide guages now in operation. They stand in much the same relation to the main tidal wave as a higher octave would to a low musical note, when their undulations are recorded graphically.

They are especially noticeable at St. John, N.B., where the amplitude of the tide itself magnifies these undulations also. The tide has there a range of some 28 feet; and the secondary undulations, which are chiefly evident at high and low water, have an amplitude which is sometimes over one foot, and a period of about 40 minutes. These minor undulations often continue for a week at a time; or even longer. An example is given on drawing No. 1; which shows portions of the actual trace from the tide gauge, and a projection of the secondary undulations from which the main tidal curve is eliminated.

Such undulations have been observed before at Halifax during the tidal observations taken there in 1863; and they are described in Shortland's "Nautical Surveying," as having a period which varied from 5 to 25 minutes, and a range which rarely exceeded four inches. This corresponds with the lower amplitude of the tide at Halifax. Similar undulations have also been observed at Malta. It does not appear that any satisfactory explanation has yet been given to account for them. The record of the Bay of Fundy tides as obtained at St. John, would probably furnish as good an opportunity as could be found anywhere to investigate this phenomenon, if there were any one who could afford time to do so as a matter of scientific interest. For the main purpose of tidal computation, these undulations are merely treated as an irregularity in the tide curve itself which has to be eliminated in its reduction.

Another matter of interest is the effect of the wind and barometer on the tides of the lower St. Lawrence. The three recording gauges at Anticosti, Father Point, and Quebec, are now giving full information regarding the progress of the tide; and the data are completed by the regular meteorological observations. The range of the tide at Anticosti is only about four feet; at Father Point twelve to sixteen feet; and at

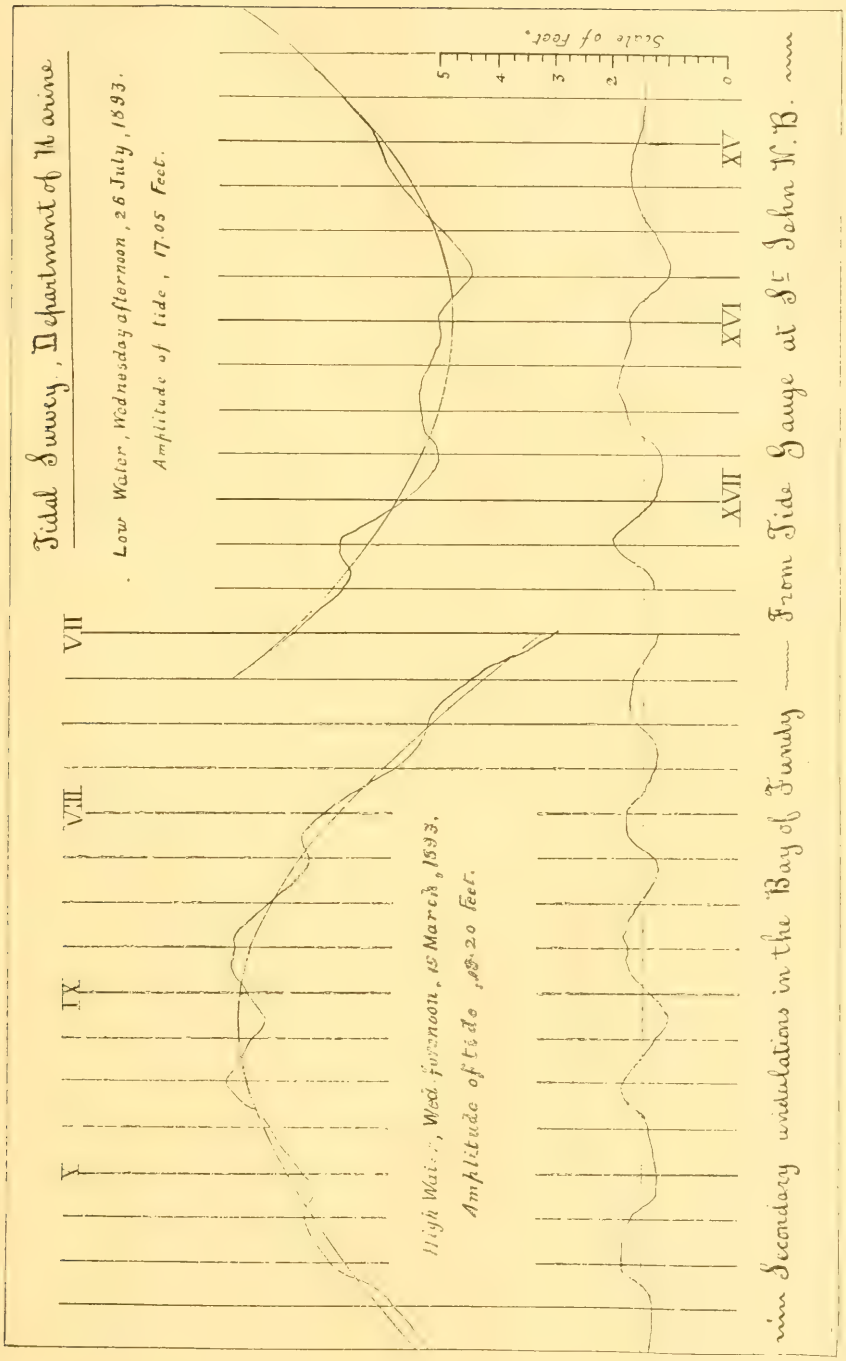
Quebec as much as twenty-two feet. It is a question whether exceptional tides at Quebec are due to the effect of the barometer on the tide in the gulf or at the mouth of the river, which becomes magnified in the same ratio as the tide itself on the way up the river to Quebec; or whether they are to be attributed to the more direct effect of the wind or barometer in the region of the lower St. Lawrence itself.

A remarkable example occurred on the 30th of January, 1894, when a drop of over an inch in the barometer in twenty-four hours was accompanied by a rise in the tide at Quebec of six feet above the normal tide at the time. As this drop occurred over the gulf area almost simultaneously with the drop at Quebec itself, and was also accompanied by strong north-easterly and easterly winds along the lower St. Lawrence, it does not afford a direct answer to the alternatives suggested above. The barometer curves from Sydney, C.B., to Quebec, are shown on drawing No. 2, and are compared with the exceptional tide at Quebec, as given by the tide gauge. The whole of these observations are reduced to a simultaneous standard of time.

On another occasion, on February 8th, of this year, when the tide rose at Quebec nearly seven feet above the normal tide at the time, there is no corresponding irregularity at Father Point; which indicates that the change in the character of the tide occurred in the course of its progress up the river. This exceptional tide took place while a severe storm centre was passing on a north-easterly course over Cape Hatteras, Boston, Miramichi, and across the centre of the Gulf of St. Lawrence.

It may often happen that exceptionally high or low tides occur at the neaps, when they may appear to an ordinary observer as a spring tide at the wrong time of the month; and it is only when they occur at the springs that they attract the public attention as something unusual. On a self-registering gauge, however, the irregularity at any time is very evident.

The Lower St. Lawrence affords an opportunity which is probably unequalled anywhere else, for the investigation of the effects referred to; both on account of the great increase in the range of the tide, and also because the valley of the St. Lawrence lies parallel to the usual track of storms. On account of the limited amount of means and assistance with which this survey has to be carried on, all that can be attempted at present is to obtain the complete data at the time, which may serve as a basis for investigation in the future.



Secondary undulations in the Bay of Fundy — From Tide Gauge at St John N.B.

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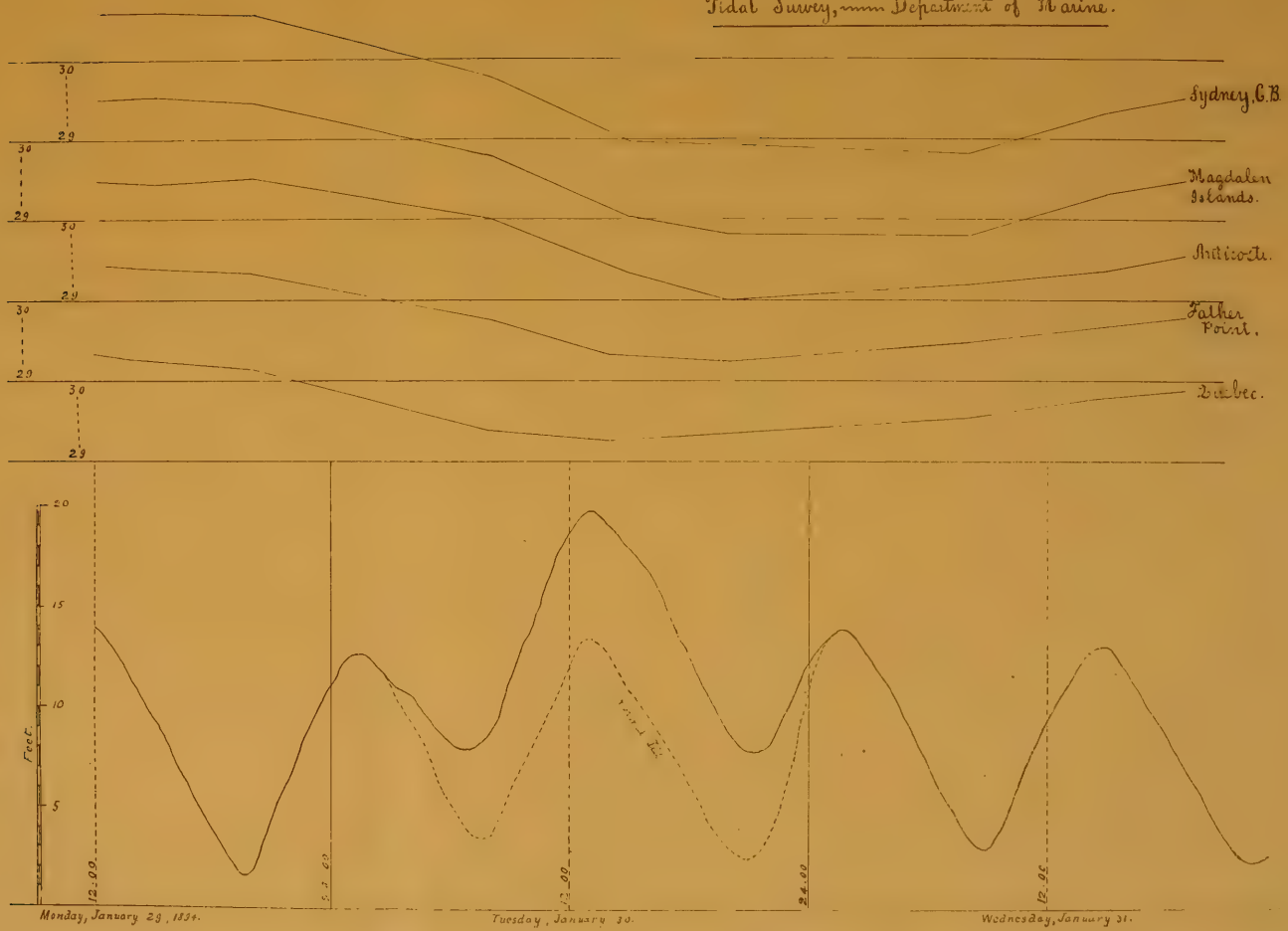

To illustrate Mr. W. BELL DAWSON's paper.

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IV.—*The Theory of the Screen in the Photo-mechanical Process.*

By E. DEVILLE.

(Read May 17, 1895.)

I. THE SHADOW OF THE SCREEN.

Although comparatively new, photo-engraving, or the "half-tone process," as it is popularly called, has grown so rapidly that it has now become an important branch of the printing trade. An investigation of its theory may therefore prove of interest.

The object of the process is to break the continuous tones of an original into equivalent tones consisting of white and black dots suitable for printing in the typographic press. For this purpose, the original is copied in the camera, but a short distance in front of the sensitive plate a screen is inserted consisting of minute opaque and transparent figures; it is adjusted to project a diffused shadow over the plate, the light being strongest under the transparent parts and weakest under the opaque parts, with varying degrees of intensity between. Whatever may be the subsequent operations, the result, if they have been properly performed, is that all parts of the print corresponding to those parts of the photographic plate which have received less than a certain amount of illumination are covered with ink, while for all parts which have received more than the said amount of illumination the surface of the paper is left bare. Illumination means here the product of the intensity of light by the time of exposure.

The first question that arises is this: How does the illumination vary within the shadow of the screen?

In copying a subject in the camera, the aperture of the lens' diaphragm may be taken as the source of illumination; seen from a point of the photographic plate, its whole surface appears evenly illuminated, if the subject is properly focussed, the illumination being proportional to the intensity of the light sent by the corresponding point of the subject.

Let *ABCD*, Fig. 1, be the diaphragm, and *MM* the plane of the sensitive plate. For a screen, let us take a single opaque figure, *LL*. There is, on the plate, a certain space, *MM*, outside of which the whole of the diaphragm is visible and the illumination uniform. There is another space, *NN*, inside of which the diaphragm is invisible and where the illumination is zero: this is the shadow proper. In the space inside of *MM* and outside of *NN*, a portion only of the diaphragm is visible, and the illumination varies according as the diaphragm is more or less covered

by the opaque figure, LL, of the screen: this is the penumbra. Designating by I the illumination outside of MM, and by q the fraction of the diaphragm visible from a point T of the plate, the illumination i at T is:

$$i = qI.$$

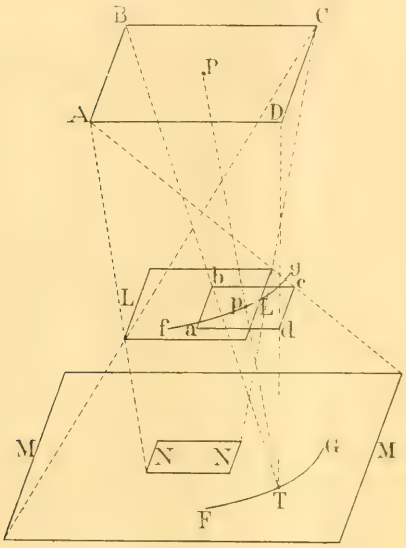


Fig. 1.

The uncovered portion of the diaphragm is found by projecting, on the plane of the screen, the perspective, $abcd$, of the diaphragm seen from T. The planes of the diaphragm and screen being parallel, the figure $abcd$ is similar to $ABCD$, and the portion of $abcd$ which is outside of the opaque figure LL, bears to the whole surface, $abcd$, the same ratio as the uncovered portion of the diaphragm bears to the whole surface, $ABCD$. The visible fraction of the diaphragm is thus ascertained by finding the fraction of the diaphragm's perspective not covered by the opaque part of the screen.

A line, FG, on the surface of the plate, such that from every one of its points the same fraction of the diaphragm is visible, is a line of equal illumination. When T is displaced along this line, the uncovered portion of the diaphragm may change its shape, but its area remains constant.

Let P be the centre of the diaphragm and p its perspective on the plane of the screen, T being the point of sight. When T moves along FG, p describes another curve, fg, which is the perspective of FG, seen from P. The screen and plate being parallel, these curves are similar, and any relation existing between the curves described by p holds good for the curves described by T. In process work, the distance from the diaphragm to the plate is so large compared to the distance from the screen to the plate, that these two sets of curves are practically equal. It will be assumed hereafter that they are exactly equal, but this is done merely for the sake of simplicity, as the relations which we will find are independent of this assumption. According to this, instead of determining the lines of equal illumination on the plate, it will be sufficient to calculate the curves described on the screen by the perspective of P when the visible portion of the diaphragm remains constant.

We will commence with the simplest case, that of the chess-board screen with square diaphragm, and we will suppose both to be so adjusted

that the perspective of the diaphragm fits as shown in $ABCD$, Fig. 2. the diagonals of the perspective being equal and parallel to the sides of the squares of the screen.

Let I be the illumination when the whole of the diaphragm is visible, as in Fig. 2, and designate by $2a$ the side of a square of the screen; the area of the diaphragm's perspective is:

$$2a^2.$$

Now displace the perspective by moving the point of sight on the plate, and take O as origin of the co-ordinates, OX and OY as the axes. The centre of the perspective comes in P, Fig. 3, its co-ordinates being x

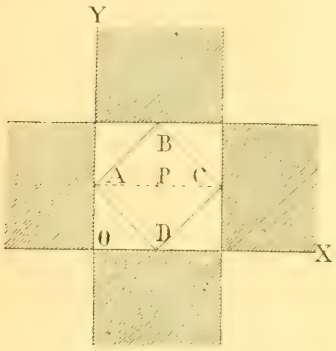


FIG. 2.

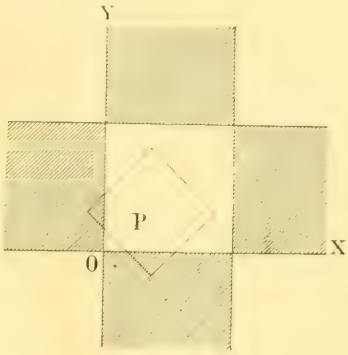


FIG. 3.

and y. The whole surface of the diaphragm has ceased to be visible: two corners are cut off by the opaque squares of the screen. The area of one corner is:

$$(a - x)^2,$$

and the area of the other:

$$(a - y)^2.$$

So the visible portion of the diaphragm is:

$$2a^2 - (a - x)^2 - (a - y)^2,$$

and the illumination:

$$i = I\left[\frac{2a^2 - (a - x)^2 - (a - y)^2}{2a^2}\right]$$

from which we obtain:

$$(a - x)^2 + (a - y)^2 = 2a^2\left(1 - \frac{i}{I}\right). \qquad (1)$$

The curve of equal illumination is therefore a circle, having its centre in the middle of the transparent square of the screen. The relation holds good so long as the portions cut off from the diaphragm are right angle triangles; that is, so long as P remains within the square, $ABCD$, Fig. 2. When outside, as in Fig. 4, the visible portion of the diaphragm becomes

$$a^2 + 2xy,$$

and the illumination,

$$i = I\left(\frac{a^2 + 2xy}{2a^2}\right).$$

hence:

$$xy = a^2\left(\frac{i}{I} - \frac{1}{2}\right). \qquad (2)$$

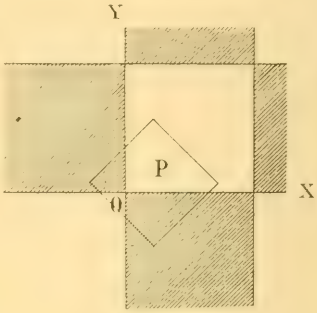


FIG. 4.

The curve of equal illumination is an hyperbola, with the sides of the transparent square as asymptotes.

FIG. 5.

This last formula does not change when P comes into the opaque square, as in Fig. 5; the curve of equal illumination is still an hyperbola, with the axes of co-ordinates as asymptotes. But, when the visible portion of the diaphragm is reduced to two right angle triangles, as in Fig. 6, the curve again becomes a circle. For the area of this visible portion is in that case:

$$(a - x)^2 + (a + y)^2,$$

and the illumination:

$$i = I\left[\frac{(a - x)^2 + (a + y)^2}{2a^2}\right],$$

hence:

$$(a - x)^2 + (a + y)^2 = 2a^2\frac{i}{I}. \qquad (3)$$

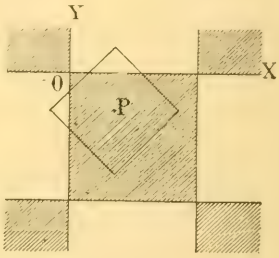


FIG. 6.

The centre of these circles is the middle of the screen's opaque square; as in the transparent square, the curves of equal illumination are circular so long as P is within the square formed by joining the middle of the sides of the opaque square.

When i is equal to one-half of I, the line of equal illumination coincides with the sides of the screen's squares.

The curves are plotted in Fig. 7 for values of $\frac{i}{I}$, increasing in arithmetical progression from $\frac{1}{20}$ to 1.

If we take for i that critical amount of illumination which is just sufficient to prevent the deposit of ink on the corresponding part of the print, the curves of Fig. 7 indicate the shape of the dots. They are black dots under the opaque square of the screen, and white dots under the transparent square. For $\frac{i}{I} = \frac{1}{2}$, they become alternate black and white squares, the print being an exact copy of the screen. We will call this the middle tone of the print.

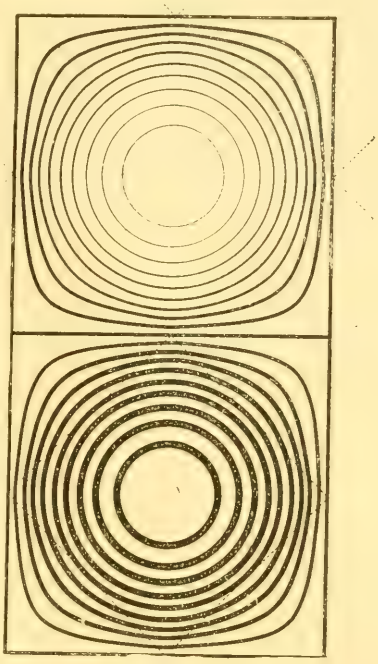


FIG. 7.

A cross-lined screen, in which the opaque and transparent lines are of equal width gives precisely the same curves as the chess-board screen. The screen and diaphragm must be adjusted to fit as shown in Fig. 8; this condition is fulfilled when the distance, f, from the screen to the plate is :

$$f = \frac{F}{n\,\Delta}, \qquad (4)$$

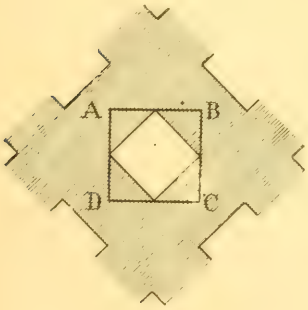


FIG. 8.

F being the distance from the plate to the diaphragm, n the number of the screen's lines to the inch, and Δ the diagonal of the opening in the diaphragm. We will see later on that this is also the proper adjustment when the transparent and opaque lines of the screen are not of equal width.

With this screen, we take D, Fig. 8, for origin of co-ordinates, DA and DC as axes, and we call $2a$ the distance from the centre of the transparent square to the centre of the intersection of the opaque lines. The equations of the curves of equal illumination are precisely the same as for the chess-

board screen. The lines of the cross-lined screen are shown dotted in Fig. 7.

There are three important differences to be noted in the behaviour of the chess-board and cross-lined screens.

1st. The squares of the print's middle tone are, with the chess-board screen, equal and parallel to the squares of the screen. With the cross-lined screen, they are turned around 45° with reference to the lines of the screen, and their area is double the area of the transparent squares.

2nd. The aperture of the diaphragm with the cross-lined screen is twice as large as with the chess-board screen, but the exposure is the same for both, because there is never more than one-half of the aperture visible from the plate through the cross-lined screen.

3rd. The relative positions of the diaphragm and of the screen's squares for one of the screens are inverted with the other screen. With the chess-board screen, the diaphragm's perspective is inscribed in the square of the screen; with the cross-lined screen, it is the square of the screen which is inscribed in the diaphragm's perspective. The characteristics of the two screens seem to be due to this inversion. Thus the effect on the dots produced by increasing the width of the transparent lines in the cross-lined screen is obtained with the chess-board screen by increasing the size of the diaphragm. With the chess-board screen, a modification in the shape of the diaphragm's aperture would require a cross-lined screen with transparent figures of the same shape, to produce the same dots.

The two screens do, however, behave exactly alike when the cross-lined screen is used in connection with a diaphragm consisting of one or more pairs of equal apertures, preferably a single pair. This screen then transforms itself, so to speak, into a chess-board screen. The distance between the centres of the components of a pair is:

$$e = \frac{F}{nf\sqrt{2}}. \qquad (5)$$

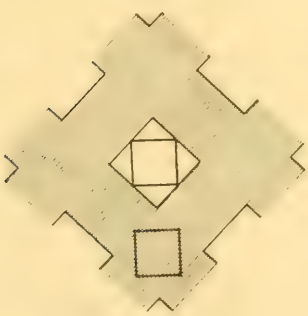


Fig. 9.

A double square diaphragm must fit as in Fig. 9 to correspond to the arrangement shown in Fig. 2.

The double aperture produces twice as many dots as the single aperture; in the shadows, there is a white dot under the middle of each transparent square, and another white dot under the intersection of the opaque lines. The squares of the print's middle tone are no longer turned around 45°: they are equal and parallel to the squares of the screen. All this can be verified by calculating the curves of equal illumination, in the same

manner as we have already done, and as the matter is quite simple, it is unnecessary to say anything further about it.

Reverting to Fig. 7, it has been explained that the curves are lines of equal illumination, the value of $\frac{i}{I}$ changing by $\frac{1}{20}$ from one curve to the next one. Under the centre of the transparent square the illumination is I; at the first curve or circle it is reduced to $\frac{19}{20}$ of I; at the next curve to $\frac{18}{20}$ of I, and so on till the last circle under the opaque square, where it is $\frac{1}{20}$ of I. Under the centre of this square it becomes zero. Thus each curve is the limit of the space or surface which has received an illumination not less than the fraction

$$q = \frac{i}{I}$$

of the original intensity.

It will be shown further on that for copying from negatives and for making vignetted screens, this space or surface must be proportional to q.

The table underneath of the areas of Fig. 7 shows that this condition is not fulfilled by the square diaphragm and the screens employed; the small dots, black and white, are too small, and the larger ones, near the middle tone, change too rapidly.

q	Area.	q	Area.	q	Area.	q	Area.
0·05	0·0393	0·30	0·2373	0·55	0·5986	0·80	0·8430
0·10	0·0785	0·35	0·2826	0·60	0·6648	0·85	0·8812
0·15	0·1188	0·40	0·3352	0·65	0·7174	0·90	0·9215
0·20	0·1570	0·45	0·4014	0·70	0·7627	0·95	0·9607
0·25	0·1963	0·50	0·5000	0·75	0·8037	1·00	1·0000

It will be observed that errors are equal for dots of same size, whether black or white; in other tables we will only give the areas of the white dots.

The circular dots can, with the chess-board screen, be made perfectly exact by a diaphragm of proper shape, but the discrepancy near the middle tone cannot be removed entirely, although it may be reduced as much as desired.

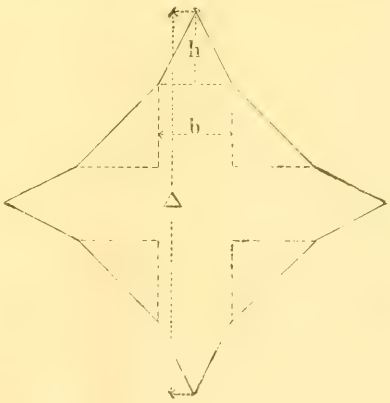


FIG. 10.

The general shape of diaphragm indicated by theory is one involving two separate exposures, and is shown in Fig. 10. It consists, for the first exposure, of a square of which the corners are cut off and replaced by triangles.

Designating by h the height of a triangle, by b the base, and by m the ratio between the second and the first exposure, we must have :

$$h = \frac{1}{2}\, b\, (m + 1) \qquad (6)$$

The length of b is given by the equation :

$$b = \frac{\Delta}{m + 2}\left[1 - \sqrt{1 - \left(\frac{4}{\pi} - 1\right)\left(\frac{2}{m} + 1\right)}\right] \qquad (7)$$

in which Δ is the diagonal of the figure and π the ratio of the circumference to the diameter. The first exposure is given through the whole aperture; the second one through the central cross shown by broken lines on the figure.

It would unduly expand the limits of this paper to give the full theory of this diaphragm, and it is quite sufficient for our purpose to calculate the curves which it gives, without inquiring any further.

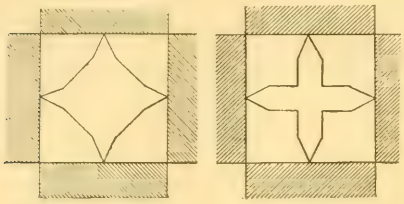


Fig. 11.

This diaphragm is adjusted so that its perspective will fit in the squares of the screen as in Fig. 11. The aperture of Fig. 10 is calculated for equal exposures; the value of b is :

$$b = 0{\cdot}192\ \Delta.$$

The calculated curves are shown in Fig. 12. The smaller dots still are circles; the larger ones are composite curves, consisting of arcs of circles, ellipses and hyperbolas. Their areas are given hereunder.

q	Area.	q	Area.
0·05	0·05	0·30	0·2921
0·10	0·10	0·35	0·3349
0·15	0·15	0·40	0·3794
0·20	0·20	0·45	0·4386
0·25	0·25	0·50	0·50

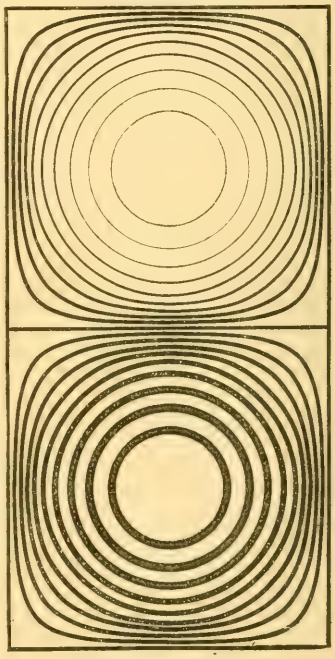


Fig. 12.

The first five dots are circles: their areas are absolutely correct. The square of the middle tone is, of course, correct. The errors in the remaining four dots are very much reduced.

The perfection of this result may be improved by increasing the ratio

between the second and the first exposure and modifying the shape of the aperture accordingly, the only limit being the length of exposure which the operator is willing or can afford to give. It is unnecessary to add that the order of the exposures is immaterial; they may commence with the cross and end with the whole figure.

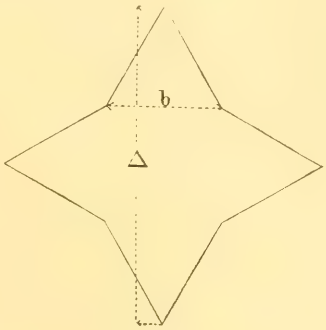


FIG. 13.

The cross exposure may be made less than the one with the whole figure, but only up to a certain point. The point is reached when the quantity under the radical in (7) becomes equal to zero. When the calculations are made, it is found that the figure assumes the shape of a star, like Fig. 13. The whole figure and the inner cross being now identical, there is no longer any necessity for two separate exposures. The value of b, which is the side of the square formed by joining the four inner angles of the star, is:

$$b = 0{\cdot}363\ \Delta,$$

Δ being the diagonal of the star. The height of the triangles forming the four wings is:

$$h = 0{\cdot}318\ \Delta.$$

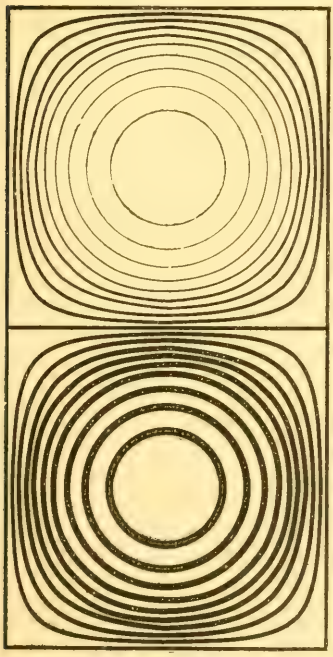


FIG. 14.

The dots produced by this aperture are given in Fig. 14. The smaller ones still are circles, the larger ones being bound by arcs of circles, ellipses and hyperbolas. Their areas are:

q	Area.	q	Area.
0·05	0·05	0·30	0·2836
0·10	0·10	0·35	0·3235
0·15	0·15	0·40	0·3689
0·20	0·1990	0·45	0·4215
0·25	0·2437	0·50	0.50

The three smaller dots, which are circles, are correct. The error for the other dots, although larger than with the two separate exposures, is small, and I believe that this shape of aperture will answer all practical purposes.

As already explained, any shape of diaphragm suitable for a chess-board screen is adapted to the cross-lined screen by using pairs of apertures, the distance between the components of a pair being given by (5), but it is necessary to have a screen in which the opaque and transparent lines are of equal width. Correct gradation cannot be produced with a cross-lined screen by means of a diaphragm having a single aperture.

II. Copying from Positives.

The object of the photo-mechanical process is to produce a print which will be an exact copy of the original. Before proceeding further we must define what an exact copy is in this particular case.

A print is an exact copy of the original when any tone of the print and the tone of the original which it represents, send out or reflect light of equal intensity.

In an original on white paper, a tone is produced by a semi-opaque film. The incident light has to pass through this film a first time before reaching the underlying surface of the paper, and is partly absorbed on the way. The remainder is reflected and diffused by the paper, after which it has to pass a second time through the film, where it is again partly absorbed. What is left is the light sent out by the tone in question; it varies, according to a certain law, with the opacity of the film.

In a half-tone print made with black ink on white paper, the incident light falling on the ink is, we will assume, entirely absorbed; that falling on the white surface is reflected and diffused, the intensity of the light sent out being proportional to the percentage of white paper in the tone—that is, proportional to the area of the white dots.

Let L be the intensity of the light sent out by the pure white paper: the intensity for the middle tone of the print is $0{\cdot}5\ L$, because one-half of the surface is covered by ink. Reducing the white dots to one-half of the middle tone squares, the intensity becomes $0{\cdot}25\ L$, because three-quarters of the surface are covered with ink. With black dots of this size, the intensity is $0{\cdot}75\ L$, because three-quarters of the surface are bare.

I assume that black ink does not reflect any light; this is not quite true, but is sufficient for our purpose. I find from photometric measurements on a good half-tone print, that the intensity of the light coming from the ink is only $\frac{1}{50}$ of the intensity for the white paper; this quantity is so small that we may neglect it.

Screens and diaphragms adjusted as we have seen would give very bad results in copying from positives. An investigation of the matter shows that the illumination is too small in the central parts of the dots, black and white, while it is excessive on the edges of the squares of the middle tone. With the cross-lined screen, for instance, it would be necessary to give a supplementary illumination under the central part of the trans-

parent squares, for improving the shadows, and under the intersection of the opaque lines, for improving the lights. This is done for the lights by making the transparent lines of the screen wider than the opaque lines. Fig. 15 shows a screen in which the transparent lines are double

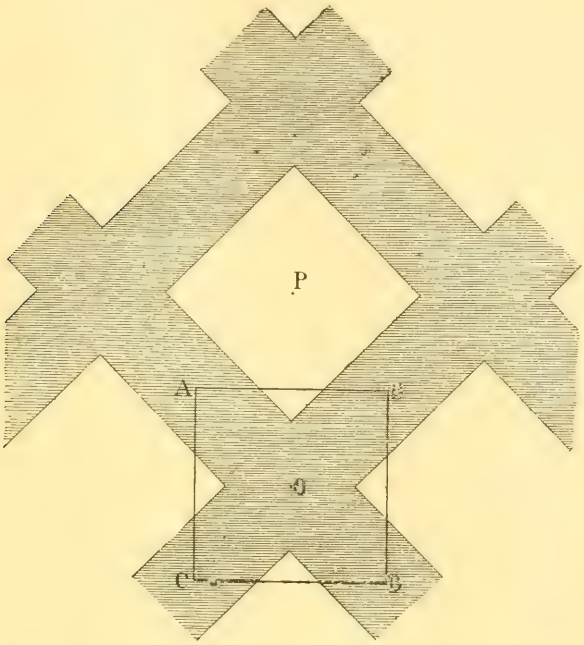


FIG. 15.

the width of the opaque lines; the perspective of the square diaphragm is adjusted over the intersection of the opaque lines, *AC* being equal to *PO*. With the screen made of lines of equal width, the diaphragm, in this position, was entirely hidden by the opaque lines: now, there are four triangular portions visible from the plate which give under *O* a certain amount of supplementary illumination, the effect of which is to improve the high lights. The shadows, however, are injured in proportion as the lights are improved.

I have now to explain why the diaphragm must be adjusted as in Fig. 15; this necessitates a digression.

The grain which we have been considering so far is one consisting of isolated black and white dots; only in the middle tone do the dots come into contact, and then only at one point, the corner of the squares. It must not be supposed that any screen or any diaphragm produces a grain of this kind; on the contrary, it is the exception and not the rule. It is not obtained with other screens than the cross-lined and chess-board, and

even then, not without precise adjustment of diaphragm and screen. The general form of grain is reticulated ; the small dots may or may not be isolated, but the larger ones are connected, the black ones by thin black lines, or the white ones by thin white lines. These thin lines have an ill effect on the printing qualities of the block ; the black ones spread and the white ones clog in printing. Being so thin, they are liable to break in development and to cause uneven tints. These lines do not appear or disappear gradually ; while the dots are still a considerable distance apart, a very slight change of illumination causes the connecting lines to shoot out between them. This sudden accession to the area of the dots destroys the continuity of the gradations.

The adjustment given in Fig. 15 produces a print of which the middle

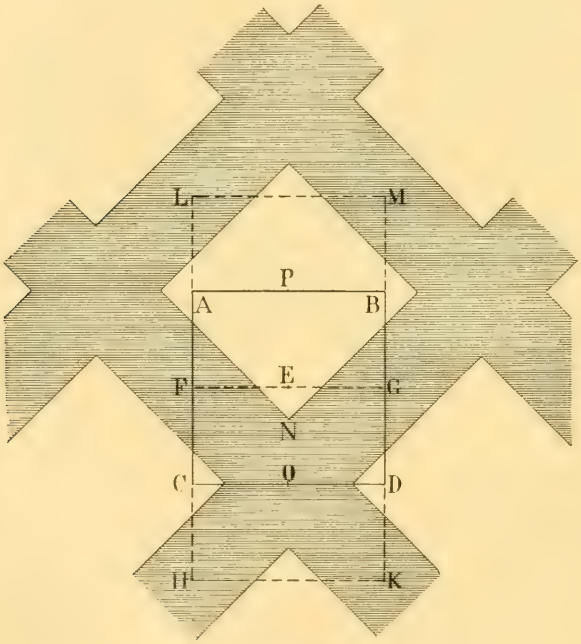


Fig. 16.

tone consists of equal black and white squares. To prove this, move the perspective of the diaphragm to the position *ABCD*, Fig. 16 ; the visible portion is :

$$S = (a + b)^2,$$

a being one-half of PO and b the distance EN. Moving now the centre E of the perspective around the squares $FLMG$ and $HFGK$, it is found that the area of the visible portion remains constant. The sides of the squares being lines of equal illumination, these squares are the dots of the

print's middle tone. The construction of the curves for any other dots shows that they are not connected.

With a larger or a smaller diaphragm, *FG* and the other sides of the squares cease to be lines of equal illumination ; there are, therefore, no dots of that shape in the print, and its middle tone no longer consists of equal black and white squares. The construction of the curves shows that the larger dots are connected. Too small a diaphragm gives con-

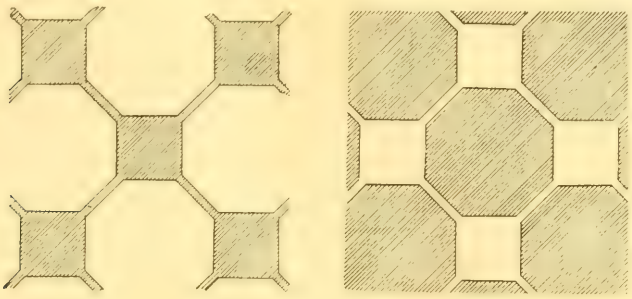


FIG. 17.

nected black dots; one too large gives connected white dots. Both are illustrated in Fig. 17 for diaphragms much out of adjustment. With better adjustment the effect would be less marked.

Let us now take an original made with black ink on white paper. To be an exact copy the print must be formed of tones equivalent to those of the original. Where the pure white of the paper is preserved in the original, black dots must be absent in the print. Here we meet a difficulty : the dots in the engraved block are in relief and the depressions between them are very shallow. If more than a few dots are omitted, there is nothing left to support the inking-roller, which is pressed against the bottom of the depressions and the print is not clean. Consequently, unless the extent of the high lights be very small, we cannot produce a print which will be an exact copy of the original; the high lights, instead of being pure white, must be a tone consisting of black dots, which may, however, be as fine as it is possible to print. We will consider the case where the extent of the high lights is so small that the dots can be omitted.

Let L be the intensity of the light coming from the pure whites of the original: leaving out the screen, the illumination received by the photographic plate at a point corresponding to the pure white is CL, C being a constant depending upon the length of exposure, aperture of diaphragm, etc. The intensity for any other tone of the original may be represented by pL, p being a fraction smaller than one; it causes an illumination of the plate equal to CpL. Now insert the screen ; the

aperture of the diaphragm, of which the full area R was formerly visible from the plate, is partly hidden by the opaque lines of the screen, leaving only the portion r uncovered. The illumination becomes :

$$i = CpL\,\frac{r}{R},$$

or, if we designate by Q the largest portion of the diaphragm's aperture visible through the screen, and by q the fraction thereof visible from the particular point of the plate under consideration :

$$i = CpL\,\frac{Qq}{R}.$$

We can take for i the critical amount of illumination which determines the formation of the dots; it is approximately what Messrs. Hurter and Driffield call the "*inertia*" of the plate. The outlines of the dots will then be the curves for which the uncovered fraction of the diaphragm is :

$$q = \frac{iR}{CpLQ}. \qquad (8)$$

For $p = 1$, that is, for the pure whites, the illumination at the darkest point, O, of the plate (Fig. 15) must not be less than i, otherwise a black dot would be found in the print. It must not be more than i, because a tone, pL, of the original, less bright than pure white, would be represented by pure white in the print. It must, therefore, be equal to i. As the value of q for this point, O, is $\frac{4b^2}{Q}$, we must have :

$$\frac{4b^2}{Q} = \frac{iR}{CLQ}.$$

Introducing this value in equation (8), it becomes :

$$q = \frac{4b^2}{pQ}. \qquad (9)$$

We now have only to calculate by means of equation (9) the value of q for each tone p of the original, and, with these values of q, to plot the curves of equal illumination in the same way as we did before. They are represented in Fig. 18 for values of p increasing in arithmetical ratio from $\frac{1}{20}$ to 1, and for a screen in which the opaque lines are one-half the width of the transparent lines ; these lines are shown dotted in the figure. The values of q are given hereunder.

p	q	p	q	p	q	p	q
1·00	0·143	0·70	0·204	0·40	0·357	0·10	1·429
0·95	0·150	0·65	0·220	0·35	0·408	0·05	2·857
0·90	0·159	0·60	0·238	0·30	0·476	0·00	∞
0·85	0·168	0·55	0·260	0·25	0·572		
0·80	0·179	0·50	0·286	0·20	0·714		
0·75	0·191	0·45	0·317	0·15	0·952		

For $p = 1$, q is $\frac{1}{7}$ or 0·143.

As p decreases, q increases, slowly at first and more rapidly after, until the value of 1 is reached for $p = 0{\cdot}14$. This value of q, representing the full effective aperture of the diaphragm, it follows that the illumination is insufficient to produce white dots for tones of the original less bright than $0{\cdot}14\ L$; they are represented by solid black in the print.

The smaller black dots are circles; their equation is:

$$(a - x)^2 + (a - y)^2 = \frac{2}{q} a^2 \left(\frac{1}{p} - 1\right).$$

The larger dots are bound by composite curves; their equations are somewhat complicated, but it is always possible to construct the curves of any diaphragm by points. The diaphragm is placed in a number of

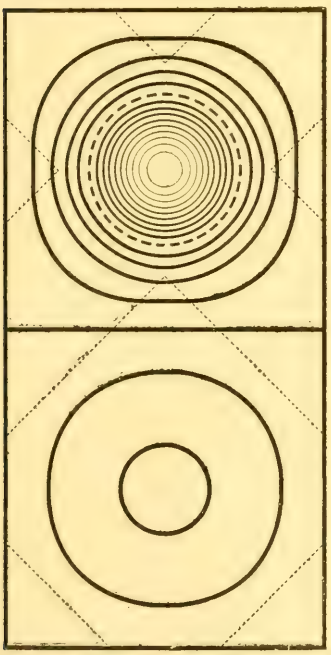


FIG. 18.

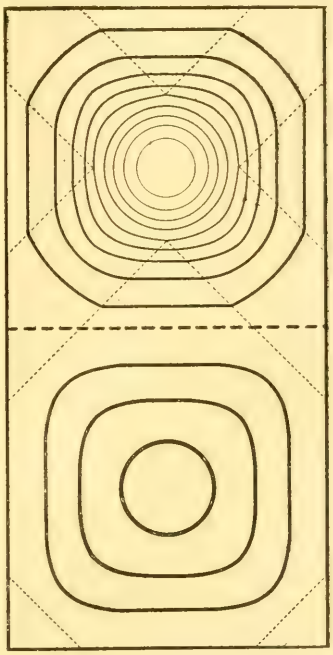


FIG. 19.

different positions over the screen, and its visible area measured for each position. The curves of equal illumination are then interpolated between the points so determined.

It is at once seen how imperfect the print is. The area of the white dots should be proportional to p and the area of the black dots to $1 - p$; that is, they should be like the dots of Figs. 12 and 14. Instead of this, we see that the original tone, $0{\cdot}5\ L$, which is one-half the brightness of the white paper, is represented in the print by the black dot shown by

a broken line in Fig. 18; it ought to consist of equal black and white squares. The original tone, 0·25 L, which is one-quarter the brightness of white paper, is represented by equal black and white squares, which are one-half the brightness of white paper. In the deep shadows, the dots disappear altogether and detail is entirely lost.

In actual practice the result is slightly different. A shorter exposure is given in order to produce fine black dots in the high lights, and all the black dots are slightly enlarged. The light tones are improved, but there is a corresponding loss in the shadows where more white dots disappear.

The proportion between the opaque and transparent lines of the screen may be varied. As the width of the opaque lines decreases, the light tones of the print are improved; the dark ones become worse. Fig. 19 illustrates an extreme case, the proportion between the transparent and opaque lines being 3·415. The light tones are very much improved, and the original tone, 0·5 L, is correctly represented by equal black and white squares, but all the original tones less bright than 0·33 L are translated into solid black. From the foregoing we may conclude that an original in which the dark tones predominate must be copied with a screen having wide opaque lines, while a subject in which light tones predominate is better translated by a screen having thin opaque lines. I am inclined to believe that the opaque lines should not be much more than one-half and not much less than one-third the width of the transparent lines.

A larger diaphragm than the correct size, or, what is the same thing, adjusting the screen further away from the plate, produces approximately the same effect as a screen with thinner opaque lines; the opposite effect is produced by a smaller diaphragm or by placing the screen closer to the plate. An examination of a number of good prints shows that this mode of adapting their screen to the character of the original is resorted to by some of the best operators, but it must be used sparingly, because it is apt to produce reticulation. A reference to Fig. 15 shows what is taking place. With the larger diaphragm, the four triangular portions which are lighting the point O under the opaque lines, are increased in area, precisely as they would be if the opaque lines were thinner, while with the smaller diaphragm their area is reduced as it would be by wider opaque lines.

We already know that with the chess-board screen we must look to changes in the size of the diaphragm to produce the effect of unequal ruling of the cross-lined screen. An increase in size, as in Fig. 20, produces illumination at O under the centre of the centre of the opaque square by the four uncovered corners of the diaphragm. Making the area of these four corners one-eighth of the total area of the aperture gives the dots of Fig. 18; the dots of Fig. 19 are obtained by a still larger diaphragm, the four uncovered corners

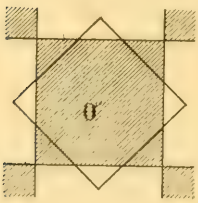


Fig. 20.

being one-quarter of the whole aperture. But we now have a resource which was not available with the cross-lined screen: we can change the shape of the aperture. Fig. 21 represents a diaphragm producing

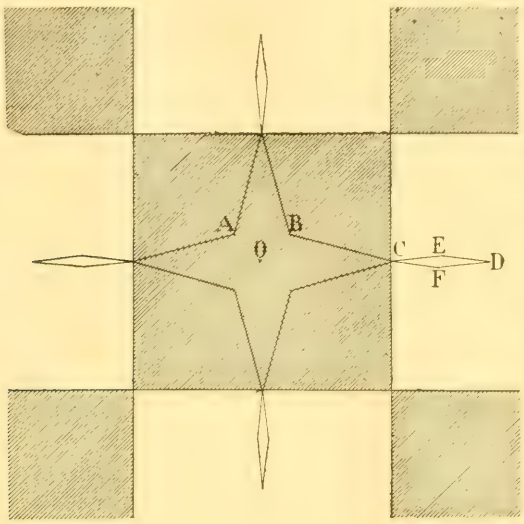


FIG. 21.

the effect of a cross-lined screen in which the transparent lines are double the width of the opaque lines. The dimensions are:

$$AB = \frac{7}{32} \sqrt{2}.$$

$$CD = \frac{25}{64} \sqrt{2}.$$

$$EF = \frac{1}{25} \sqrt{2}.$$

The dots of this diaphragm are given in Fig. 22; a comparison with Fig. 18 shows a very great improvement. The light tones are fairly translated; the dots are only a trifle too small, but the gradation is good. The light shadows are not quite so good, but much better than with the cross-lined screen; there is no improvement in the deep shadows. This diaphragm requires two and one-half times the exposure of the square diaphragm. Its rapidity may be increased by making the arms of the inner star less pointed and increasing proportionately the width, *EF* (Fig. 21), of the extensions, but that makes all the black dots smaller and the print less perfect. It is quite easy to devise other shapes of diaphragms. One is given in Fig. 27; the apertures are not so elongated as in Fig. 21, but it has the drawback of requiring very accurate adjustment.

The shorter diagonal of the rhombus-shape extensions is 0·19 of the diagonal of the central square; the longer diagonal of the rhombus is twice the length of the shorter one. Each of the smaller squares is equal to one-quarter of the area of the central square. The dots produced by this diaphragm are approximately those of Fig. 22.

A method much in vogue among operators consists in giving the exposure through several square diaphragms of various sizes. With a chess-board screen, the procedure may be as follows:

The first or preliminary exposure is given through a diaphragm *AB*, Fig. 23, placed at a distance, *OP*, from the optical axis of the lens equal to the diagonal of the aperture. The length of this diagonal is deduced from equation (16). The purpose of this exposure is to give the illumination which is lacking under the centre of the opaque squares of the screen. The illumination due to this diaphragm is maximum under the centre of these squares, while it is null under the centre of the transparent

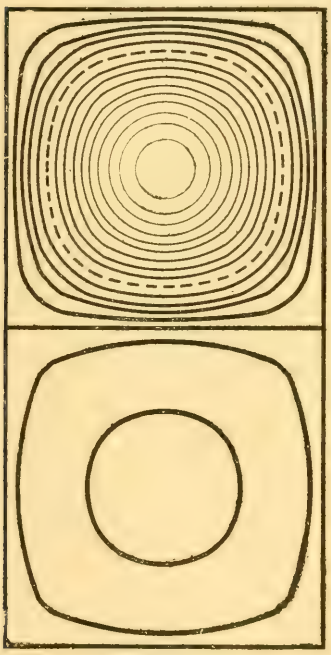


Fig. 22.

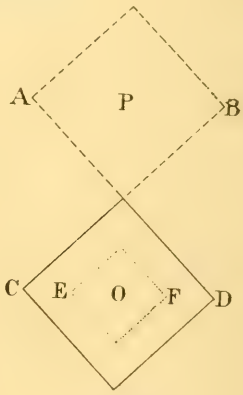


Fig. 23.

squares. The preliminary exposure should be just sufficient to give a trace of the highest lights, if the plate were fully developed and intensified.

The main exposure is given through the diaphragm *CD*, equal to *AB*, and placed in the centre of the lens; it is equal to two and a half times the preliminary exposure. This exposure determines the size of the dots in the lights, but the shadows are still very imperfect. If the plate were now developed and a block made, the middle tone of the print would be found to represent the tone, 0·57 *L*, of the original; all tones less bright than 0·4 *L* would come out as solid black.

For improving the shadows a supplementary exposure is given with the diaphragm EF, the diagonal of which is equal to one-half of CD. This exposure is from ten to fifty times the preliminary exposure; the longer it is, the greater is the range of tones reproduced by the print. It has no effect on the lights. Making it eighteen times the preliminary exposure gives approximately the dots of Fig. 22. The middle tone of the print represents the tone, 0·25 L, of the original; the shadows less bright than 0·14 L come out as solid black. In other words, the range of tones reproduced is from $\frac{1}{7}$ L to L. Designating by k the supplementary exposure, the range of the print is from

$$\frac{1}{\frac{k}{4} + 2{\cdot}5} \text{ to } 1.$$

For instance, a supplementary exposure equal to thirty times the preliminary one gives a range from $\frac{1}{10}$ to 1.

We can now understand better the mode of action of the diaphragms of Figs. 21 and 27. In both, the equivalent of the preliminary exposure is given through the rhombus-shape extensions at the corners. The supplementary exposure in Fig. 27 is given through the four smaller squares; in Fig. 21 it results from the star-shape of the main aperture. The preliminary and main exposures, in the method described above, may be replaced by a single exposure through the central part of the diaphragm of Fig. 27.

The gradations may be improved by substituting for the original a sheet of white paper during part of the supplementary exposure. Let us assume that the original is on white paper and that the highest lights are represented by the pure white. After the preliminary and main exposures let us give a supplementary exposure of 4 on the original, then substitute the sheet of white paper and give an exposure of 2. The range of tones reproduced by the print is from $\frac{1}{7}$ L to L, as in the example cited above, but the middle tone now represents the tone 0·33 L of the original, instead of 0·25 L as formerly. That is a very great improvement. On the other hand, the total exposure which, by the first method, was 21·5 times the preliminary exposure, is reduced to 9·5, less than one-half of what it was before.

The methods which we have described are all more or less imperfect. Theoretically the correct method, which involves two separate exposures, is as follows:

1st. Expose, without the screen, on the original, which we will assume again to be on white paper, and time the exposure so that if the plate were then fully developed and intensified, it would just show a trace of the highest lights of the original. The size and shape of the diaphragm are, of course, immaterial, but for the sake of simplicity in the explanations, we use the same diaphragm as in the second exposure.

2nd. Cover the original with a sheet of white paper, remove the plate-holder to the dark room, insert the screen, and give a second exposure, equal to the first one, on the sheet of white paper, using the star diaphragm of correct size (Fig. 13). If this exposure were given alone, and the plate fully developed and intensified, the negative would show an extremely fine opaque dot under the centre of each transparent square of the screen. After receiving the two exposures, the negative is developed and the usual operations follow.

Using the same notation as before, the first exposure has caused an illumination, at any particular point of the plate, equal to

$$pL.$$

The second exposure gives the illumination,

$$qL,$$

so that the total illumination at the point of the plate under consideration is

$$pL + qL.$$

The outlines of the dots are the curves for which

$$pL + qL = i,$$

or

$$p + q = \frac{i}{L}.$$

L is the illumination produced, during the first exposure, by the highest lights of the original; it is also the illumination under the centre of the transparent squares during the second exposure. In both cases we have so timed the exposures that L is just sufficient to produce printing density on the negative. But that is precisely the definition of i; therefore

$$L = i,$$

and the equation of the dots becomes:

$$p + q = 1.$$

This equation means that the tone, pL, of the original is represented by dots, from the outlines of which the fraction $1 - p$ of the diaphragm is visible. We have seen, in the first part of this paper, that the areas of these dots are practically correct.

The first exposure may be given with any kind of diaphragm, and must be just sufficient to impress on the plate the highest lights of the original, whether on white paper or not.

The second exposure can be given on any uniform source of illumination, provided it is so timed as to just produce printing density under the centre of the transparent squares of the screen. If white paper be used, it is preferable to place it out of focus, so that the grain of the

paper may not show. Each of these exposures can be timed very accurately with trial plates—a most important consideration.

We will see later on that the second exposure alone produces a vignetted screen. The mode of action in the process last described, therefore, consists in impressing, before development, a vignetted screen upon the negative.

Unfortunately the exposure on white paper obliterates, to some extent, the image in the shadows, and increases the difficulty of obtaining sharp dots with clean edges. In that respect the process is much inferior to those which we will now investigate. It has the advantage of requiring a very short exposure.

III. Copying from Negatives.

Exposure through a negative gives a transparency or positive; the interposition of the screen does not modify this relation. What is to be done with the dotted transparency does not come within the scope of this paper. Whether a negative is to be made from it, or whether, by some peculiar process, the engraved block is to be made directly from the transparency, I will leave for others to decide.

To understand what is to follow, I must give briefly Messrs. Hurter and Driffield's definitions of a perfect negative; for further explanations I refer to their original paper.[1]

The opacity of a film is the reciprocal of the number expressing the fraction of the incident light which emerges from the film. An opacity of ten lets one-tenth of the light pass, stopping nine-tenths of it. An opacity of two lets one-half of the light pass. An opacity of one does not stop any light; it is perfect transparency. The density is the logarithm of the opacity.

Two opacities, O' and O'', put together form an opacity, O, equal to the product of O' and O''. Two densities, D' and D'', produce a density, D, equal to the sum of D' and D''.

In a perfect negative the opacities are proportional to the light intensities by which they were produced. These opacities or densities are reached at a certain stage of development; with a shorter or longer development, a density, D, becomes αD, α being the "development factor."

Let L be the highest light intensity of the original, and ML the corresponding opacity of the negative. Another tone pL, of the original, is represented in the negative by the opacity MpL, and the light transmitted is $\frac{1}{MpL}$. We now place this negative in front of the camera and

[1] "Photo-chemical Investigations, and a New Method of Determination of the Sensitiveness of Photographic Plates," by Ferdinand Hurter, Ph.D., and N. Driffield—Journal of the Society of Chemical Industry, May 31, 1890.

copy it through a screen. The illumination i of the plate is, we have seen, proportional to the intensity of the light transmitted through the negative and to the area of the fraction q of the diaphragm not hidden by the screen.

$$i = \frac{Nq}{MpL}.$$

N being a constant. We may take for i the value of the illumination on the outlines of the dots and calculate q:

$$q = \frac{MpLi}{N}. \qquad (10)$$

Assuming again that the tone L of the subject is to be represented by pure white paper in the print, there must be no black dot when p is equal to one, and consequently the illumination under the centre of a transparent square, where the light is given by the full effective aperture Q of the diaphragm, must be equal to i, or:

$$1 = \frac{MLi}{N}.$$

Introducing this value in equation (10), it becomes

$$q = p \qquad (11)$$

This equation means that any tone pL of the original is transformed into dots, from the outline of which the fraction p of the diaphragm is visible.

For correct representation, the area of the white dots must be proportional to p, and the area of the black dots to $1 - p$; therefore the area of the curves of equal illumination must be proportional to q under the opaque squares of the screen, and to $1 - q$ under the transparent squares. Such curves are given by the chess-board screen and the single or double exposure diaphragms described in the first part of this paper. The dots are shown in Figs. 12 and 14, and are practically correct.

The negative must be what is termed a "soft" one, and must be produced by full exposure and short development. It should be much less dense than for printing by contact.

The formulæ indicate that there are white dots in the deepest shadows of the print; there is no solid black. In theory this is absolutely correct, because the clear glass of the negative does not indicate absence of light in the subject, but only an illumination less than the inertia of the plate on which the negative was made. We must remember, however, that we have assumed the ink to be perfectly black, which is not the case; we should therefore close the white dots in the deepest shadows. With a negative of average density, these dots are below printing size; they do not appear in the print; with a thinner negative it is sufficient to use a diaphragm very slightly larger than the correct size.

The easiest way of making the transparency is to employ one of the enlarging and reducing cameras which have a partition in the middle, carrying the lens, and one of the ends arranged to receive the negative. The ordinary copying board is covered with white paper and set some distance away from the negative ; it is lighted, as usual, by electric light or otherwise. With a negative of proper density, the exposure need not be excessive, although longer than with the process as now worked.

It is possible to employ an arrangement like the enlarging lantern, provided the source of light be of the right kind. It must be a surface of uniform illumination ; the lime-light or the arc-light will not do. Incandescent gas-light may answer the purpose. After focussing, and before exposing the plate, the condenser should be carefully adjusted. This may be done by marking, with ink or pencil, on a piece of white cardboard, the outline of the diaphragm's aperture and inserting it in the diaphragm's slot. The condenser and light are now moved until the image of the latter is formed on the cardboard ; it must fully cover the diaphragm's aperture and be perfectly uniform. If it were otherwise, the shape of the dots would be governed, not by the diaphragm, but by the shape of the light.

IV. Copying through Vignetted Screens.

The screens which we have been investigating consist of opaque and transparent parts ; a vignetted screen is semi-opaque over its whole surface, and divided into minute zones of varying degrees of opacity. This screen must be placed in contact with the photographic plate ; its use is therefore restricted to dry plates.

It may be made to copy from an original or transparency, or from a negative ; from a practical point of view, the first case is the only one to be considered.

In copying from the original, the screen is placed as usual in the camera, but in contact with the plate ; the shape of the diaphragm is immaterial, and so is its size, provided it is not too large. A transparency may be copied in the camera or in a printing frame. The arrangement of the camera should be something like that described for copying from negatives, with the exception that any illuminant is suitable ; the arc light would answer the purpose admirably. For the printing frame, the transparency is stripped and placed between the plate and the screen. Exposure must not be given to diffused light, but to light emanating from a point, like an arc light ; the frame must be kept in the same position during the whole exposure. The theory is identical for the camera and for the printing frame ; we will investigate the latter only.

In a perfect transparency, the opacities are inversely proportional to the light intensities which they represent. Let L be the greatest light

intensity of the subject, and pL another tone, O and O_o the opacities by which they are represented; we must have

$$\frac{pL}{L} = \frac{O_o}{O},$$

or

$$p = \frac{O_o}{O}$$

and

$$D - D_o = - \log. p,$$

D and D_o being the densities of the transparency which represent the light intensities pL and L. In a transparency developed more or less than required to produce a perfect one, the last equation becomes:

$$D - D_o = - \alpha \log. p, \qquad (12)$$

α being the development factor.

A vignetted screen is produced by exposing a photographic plate to illumination which varies in amount at different points of the plate. Let l be the greatest illumination of this plate, and ql another illumination. The opacities o_1 and o produced, being proportional to the light intensities, we have:

$$\frac{ql}{l} = \frac{o}{o_1},$$

or

$$q = \frac{o}{o_1},$$

and

$$d_1 - d = - \log. q,$$

d_1 and d being the densities of the screen produced by the light intensities, l and ql, the development factor being one. With another factor, β, the equation becomes:

$$d_1 - d = - \beta \log. q. \qquad (13)$$

We place this screen and the transparency in the printing frame, and through both give the proper exposure to the plate. The negative is developed, the engraved block made and the print struck off as usual. The final result is that wherever the sum of the superposed densities of the transparency and screen has been greater than a certain density, M, there is ink on the print, and wherever this sum is less than M, the white paper of the print is left bare; the outlines of the dots are, therefore, the lines for which we have:

$$D + d = M. \qquad (14)$$

This density, M, is the one which lets through just that critical amount of illumination which was stated to be about equal to the inertia of the plate, and which is the illumination on the outlines of the dots.

Assuming, as before, that the highest light, L, of the subject, for which the density of the transparency is D_o, must be represented by pure white in the print, we must have

$$D_o + d_1 = M,$$

d_1 being the greatest density of the screen. Combining with (14), there comes

$$D - D_o = d_1 - d.$$

Replacing both members of this equation by their values from (12) and (13), we obtain:

$$- \alpha \log. p = - \beta \log. q.$$

This equation is satisfied by:

$$\alpha = \beta,$$

and

$$p = q. \qquad (15)$$

The first relation shows that the development factors of the transparency and screen must be equal; a strongly developed transparency requires a strongly developed screen.

The second relation means that the outline of the dot by which the tone pL of the subject is represented, is the line of the screen which received the illumination pl while the screen was being made. In order to produce a correct print, the surface inclosed by this line must be proportional to p for the white dots, and to $(1 - p)$ for the black dots. We know that this is approximately the result of an exposure behind a chess-board screen through a star or double exposure diaphragm; we are, therefore, able to make vignetted screens possessing the gradations required to produce exact copies of an original. For this purpose we expose a photographic plate on a piece of white paper placed out of focus, the diaphragm and screen being adjusted as explained in the first part of this paper.

The theory for copies in the camera is so much like the theory for contact copies in the printing frame, that further explanations are not needed.

The vignetted screen having to be placed in contact with the photographic plate, its face cannot be protected by a glass cover; it can only be varnished. Very likely it will soon be scratched or damaged, and will have to be replaced frequently. The operator should have a set of screens of various densities to select from; light screens for light transparencies, and dark screens for intense transparencies. There does not appear to be any reason why every operator should not make his own vignetted screens; they are produced by operations with which he is familiar, and which do not present any special difficulty. The plate on which the screen is to be made is, we have seen, exposed behind a chess-board screen through a star or double exposure diaphragm. The correct exposure is

ascertained by trial. After development the screen is found to consist of semi-transparent and semi-opaque dots alternately disposed; examining it under a moderately strong microscope, the central part of the semi-transparent dots must be thin, but not clear glass. The presence of minute spots of clear glass indicates under-exposure. Under a strong microscope it will be found that, even with correct exposure, there are very minute dots of clear glass in the centre of the semi-transparent dots; their size must be kept down by a full exposure. A screen not sufficiently developed does not reproduce the deep shadows; they come out solid black in the print, and the shadows are generally too dark. A screen too much developed gives a print in which the shadows are too light; there is no solid black. Under-exposure is indicated by the absence of the finest white dots in the print. A long exposure, within reasonable limits, gives a dense screen, but correct gradations; the only disadvantage is that it takes a long time to print. The collodion or emulsion must be of a kind giving soft negatives with good gradation. Special care must, of course, be taken to have the plate perfectly clean and everything in first class working order, so as to secure a screen free from defects.

In theory, the vignetted screen is the most perfect one for the photo-mechanical process, because correct prints may be obtained from thin or intense transparencies by using thin or intense screens, while in copying from a negative through a chess-board screen, the negative must be of right density to give a correct print.

V. The Diaphragms.

The proper shapes for the apertures in the diaphragms, or "stops," as they are more generally called, have been described in the course of this paper; we have now to consider their adjustment.

The square is the only shape adapted to the cross-lined screen with unequal lines; its adjustment has been given in equation (4):

$$f = \frac{F}{n\Delta}.$$

But this is not the proper way to use a cross-lined screen. Its opaque and transparent lines should be of equal width, and it should be employed with double aperture stops, so as to work like a chess-board screen. The adjustment of the diaphragm is then given by the formula:

$$f = \frac{F}{2n\Delta},$$

or

$$\Delta = \frac{F}{2nf}. \qquad (16)$$

The distance between the centres of the pair is:

$$e = \Delta\sqrt{2}.$$

The cross-lined screen, employed in this way, gives twice as many dots as otherwise; a coarser ruling must be taken to obtain the same fineness of grain. If, for instance, it should be desired to have the grain of 150 lines to the inch, the screen for the double aperture should be ruled 106 lines to the inch. It must also be observed that, with the double aperture, the squares of the middle tone are not turned around 45°; to keep them turned in the print as they now are, the ruling must be parallel to the sides of the screen, not to the diagonals. The double aperture diaphragm, illustrated in Fig. 29, is for screens so ruled.

The adjustment of the chess-board screen is the same as for the double aperture, and is given by equation (16), n being the ruling from which the screen is made and $\frac{1}{2n}$ inch the side of a square of the screen. In the aperture of Fig. 21, Δ is the diagonal of the inner star.

In equation (16) we have two variable quantities, Δ and f; the adjustment can therefore be made by changing the size of the diaphragm, or by changing the distance of the screen, or by both. So long as the product of Δ and f is equal to $\frac{F}{2n}$, it does not matter whether the diaphragm is small and the screen far from the plate, or the diaphragm large and the screen close to the plate; the result is identical. In practice, there are many reasons why the diaphragm, and not the screen, should be made adjustable; I will only give one. It is essential that the distance f from the screen to the plate be uniform throughout, and, being so very small, no adjustable arrangement can accomplish that satisfactorily.

The screen should be perfectly flat, and, for large sizes at least, nothing but plate glass should be used for the negative or transparency. The screen and plate should be separated by blocks of silver or glass, planed down to an accurate thickness, and they should be brought by pressure into close contact. This pressure must be applied to the edges and not to the centre of the plate.

I consider $\frac{1}{6}$ of an inch as being about the right distance between the plate and the screen. This allows a glass cover $\frac{1}{16}$ inch thick to protect the screen and leaves about $\frac{1}{10}$ inch between the face of the plate and the glass cover, which is quite enough. It is this distance which I have adopted for the following classification.

All diaphragms, whether consisting of a single aperture, or of a pair of apertures, or of multiple apertures, and whatever their shapes may be, are included in one general series. In number zero of the series, the diagonal of the single aperture is one-quarter of an inch. There is an exception for the square diaphragm now in general use with cross-lined screens: for this shape or multiples of this shape, the diagonal of number zero is one-half inch. No smaller sizes are likely to be required for this process. The linear dimensions of the other diaphragms increase in geometrical

progression from this size, the ratio being 1·05. Each diaphragm bears two numbers: the first one is the serial number and indicates the place of the diaphragm in the series; the second one is a number of inches which represents the extension of the camera to which it is adapted, when the screen used is ruled 100 lines to the inch or made from this ruling, and also when the distance from the screen to the plate is one-sixth of an inch. The camera extension is readily ascertained by nailing a yard measure on the tailboard and adjusting it to show the distance from the diaphragm to the plate. So, an operator using a screen of one hundred lines to the inch has only to select the diaphragm bearing the number of inches which, after focussing, he reads on the tailboard of the camera.

If the screen should not be ruled 100 lines to the inch, then, for 105 lines take the next smaller diaphragm of the series; for 110 lines, take two sizes smaller; for 116 lines, take three sizes smaller and so on. When the screen is 95 lines, take the next size larger; if 91 lines, take two sizes larger, etc. The classification of the screens is as follows:—

71	lines to the inch is	7 stops	coarse.
75	" "	6	"
78	" "	5	"
82	" "	4	"
86	" "	3	"
91	" "	2	"
95	" "	1 stop	"
100	" "	0	"
105	" "	1 stop	fine
110	" "	2 stops	"
116	" "	3	"
122	" "	4	"
128	" "	5	"
134	" "	6	"
141	" "	7	"

The number of inches to be marked on each diaphragm is given by equation (16):

$$F = \frac{200}{6} \Delta.$$

For the exceptional square shape this number of inches is deduced from equation (4), and is only one-half of the above.

A screen ruled n lines to the inch requires a diaphragm in which the diagonal Δ' of the single aperture is such that:

$$\frac{\Delta'}{\Delta} = \frac{100}{n}.$$

The difference x of the serial numbers of the sizes Δ' and Δ is governed by the relation :

$$\left(1 \cdot 05\right)^x = \frac{100}{n},$$

or

$$n = \frac{100}{(1 \cdot 05)^x}.$$

The classification of screens given above was calculated by this formula.

The principle of this series is easy to understand. The idea is to have two numbers on each diaphragm, one, a number of inches, for adjusting it to the lens, and another one, the serial number, for adjusting it to the screen.

A full set of diaphragms for one lens and one screen consists of fourteen numbers ; they are taken from the general series and fitted to the lens. For more than one screen, there must be as many additional stops as between the coarsest and the finest screen. Thus for screens of 91 and 110 lines, the set consists of 14 + 2 + 2, or 18 diaphragms, because 91 lines is two stops coarse and 110 lines two stops fine.

Although the basis of this system is a distance of the screen of $\frac{1}{6}$ inch, the series may be used for any other distance, but with this difference, that the numbers on the diaphragms are for another screen than 100 lines. For instance with a distance of the screen of $\frac{1}{5}$ inch, the numbers correspond to a screen of 83 lines, and it is from it that the other screens have to be counted coarse or fine.

The illustrations represent the actual sizes of numbers of the series. Those who are familiar with the photo-mechanical process will find them somewhat smaller than the square stop to which they are accustomed, and may believe that they are proportionately slower. It is not so ; their rapidity must not be estimated from their comparative sizes. There are two reasons for this. The first one has already been stated ; as now used, there is always a portion of the square aperture hidden by the screen, while the full aperture of the new stops is, in most cases, effective. The second reason is that to obtain the same fineness of grain as at present, the new stops require a coarser screen which means a larger aperture. Where a longer exposure is required, it is, as in copying from negatives, by reason of the process and not on account of the sizes of the apertures.

The exposure can be reduced by the use of multiple apertures instead of single ones ; this can be done with any kind of screen. The exposure is reduced as many times as there are apertures in the diaphragm. It must be borne in mind that multiple apertures require great perfection in the screen and very accurate adjustments. For a double aperture, the screen must be three times more perfect and the adjustments three times

more accurate to give as good a result as the single aperture. There is little doubt that the most perfect prints will be obtained with single apertures.

Fig. 24 is the square stop now used with cross-lined screens ruled diagonally.

Fig. 25 is the same stop with four square apertures, requiring one-fourth the exposure of the first one. The number of apertures may be

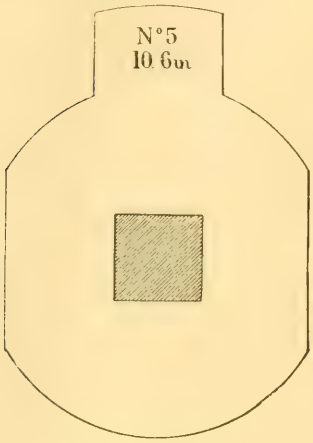


Fig. 24.

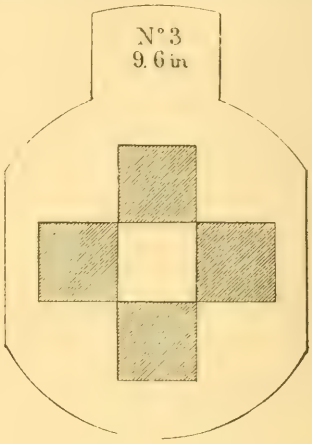


Fig. 25.

two, three, four, five or any other number; the rule is to dispose them like the squares of a chess board.

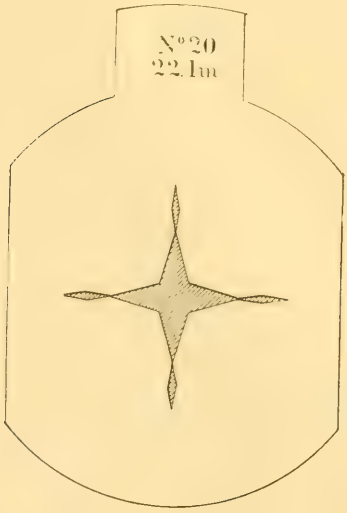


Fig. 26.

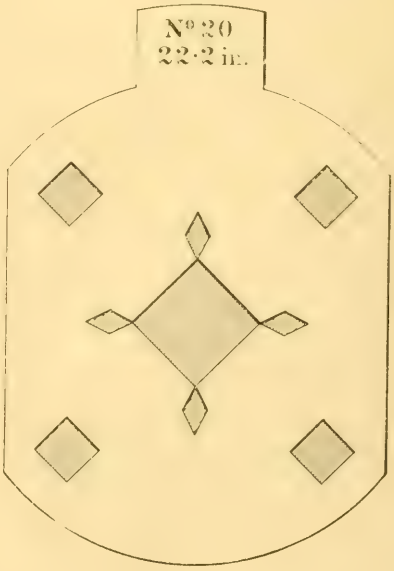


Fig. 27.

Fig. 26 is for copying from originals through a chess-board screen ; it requires two and a half times the exposure now given to produce the same grain.

Fig. 27 is also for copying from an original through a chess-board screen : it has multiple apertures and therefore requires shorter exposure.

All the above are for copying from originals and are given merely as illustrations of this paper. To obtain correct results, some of the following shapes have to be employed.

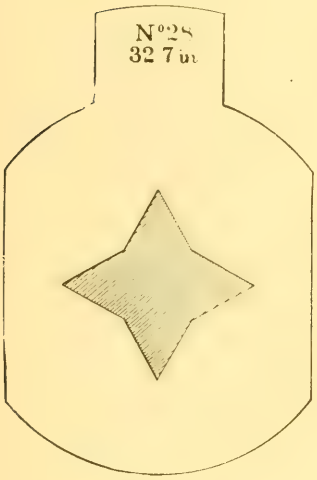


FIG. 28.

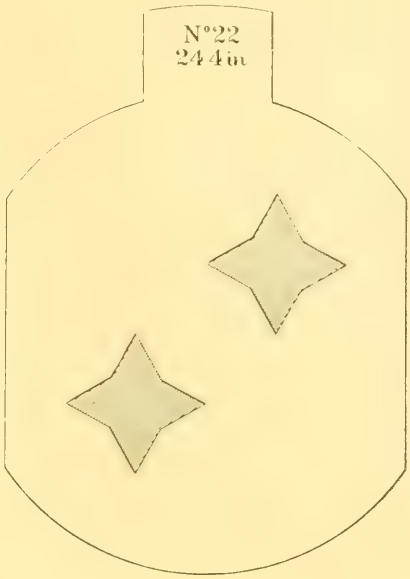


FIG. 29.

Fig. 28 is the single star aperture for the chess-board screen.

Fig. 29 is the double star aperture for a cross-lined screen in which the lines are of equal width and parallel to the sides of the screen.

Fig. 30 is a five-aperture diaphragm for the chess-board screen only. The general rule for making a multiple diaphragm for the chess-board screen is that each star must be inscribed in the alternate squares of a chess board. The rule for the cross-lined screen is that there must be one pair or several pairs of apertures ; the line joining the centres of the components of any one pair must be inclined at 45° to the lines of the screen.

Fig. 31 is a single aperture and double exposure diaphragm for the chess-board screen ; it is made in the shape of a reversible Waterhouse diaphragm. The first exposure is given through the full aperture, after which the cap is put on the lens, the diaphragm reversed end for end in the slot and the second exposure given. This diaphragm may, like the others, be made with multiple apertures by the rules given above.

There may be cases where it is desirable to modify the gradations of the print; this can be done by remembering the following rule:

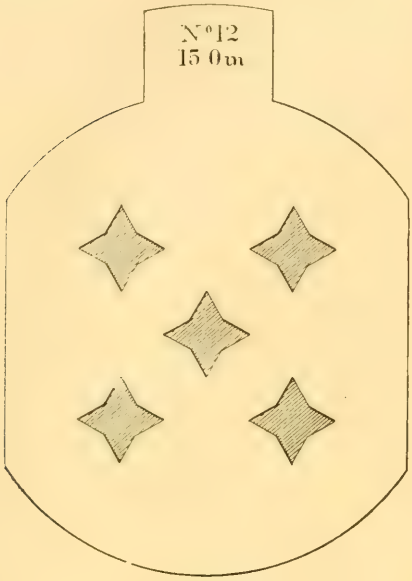


Fig. 30.

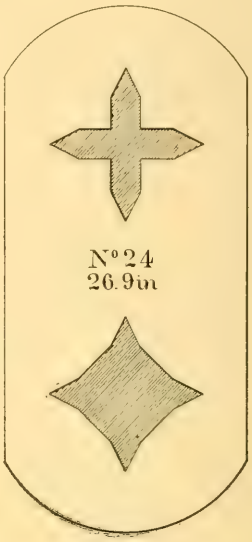


Fig. 31.

The dots, black and white, are enlarged by making the points of the star more acute in the diaphragm's aperture; they are reduced by making the points more obtuse. The squares of the middle tone and the finest dots are not changed.

VI. Conclusions.

From these investigations we conclude that there are three methods for translating correctly the continuous half-tones of an original into tones consisting of white and black dots.

1st. By copying from the original, giving a first exposure without a screen on the original, and a second exposure, through a chess-board or cross-lined screen, on a sheet of white paper or other source of uniform illumination. This method does not produce dots with edges as sharp and clean as the other two methods.

2nd. By copying from a negative through a chess-board or cross-lined screen. A negative of proper density produces a perfect result, but it gives a transparency and therefore requires some new process for etching the block.

3rd. By copying from the original or printing through a transparency with a vignetted screen in contact with the photographic plate.

This method is unfortunately restricted to dry plates, otherwise it would be the best of the three.

The cross-lined screen mentioned above is one in which the opaque and transparent lines are of equal width and has to be used with a double aperture diaphragm, but it must be remembered that in order to produce as good a result as the chess-board screen, the adjustments of the screen, plate, and diaphragm, would have to be three times more accurate and the screen itself three times more perfect.

V.—*Preliminary Results of Observations of Soil Temperatures with Electrical Resistance Thermometers, made at the McDonald Physics Building, McGill University, Montreal.*

By HUGH L. CALLENDAR, M.A., F.R.S., McDonald Professor of Physics.

(Read May 15, 1895.)

The following series of observations of soil temperatures with buried thermometers was undertaken in continuation of some experiments made by Prof. D. P. Penhallow and Prof. C. McLeod, of McGill University. Prof. Penhallow made an extended series of such observations during the years 1882-1883, in the summer months, with mercury thermometers of special design. These observations could not conveniently be continued through the winter. An attempt was accordingly made at the McGill College observatory, in conjunction with Prof. McLeod, to replace the mercury thermometers by thermocouples. This admitted of readings being taken indoors without disturbing the buried instruments, but in spite of every precaution in fitting up the thermocouples and in taking the observations, the indications were not found to be sufficiently accurate.

In transferring the site of the observations to the McDonald Physics Building, it was accordingly decided to try a set of electrical resistance thermometers in place of thermocouples. The instruments were obtained and placed in position in the month of October, 1894. Observations have been taken continuously since that date. It is not yet possible, from so limited a series of observations, to deduce many results of general importance, but a description of the method and of the results so far obtained will serve to show the special applicability of this type of thermometer to the determination of soil temperatures, and to indicate the direction in which further experiments may be made.

DESCRIPTION OF THE INSTRUMENTS.

The thermometers were made of the usual pattern by the Instrument Company, Cambridge, England. Each instrument consists of a carefully insulated coil of platinum wire about three inches long, protected by an external tube of glass or copper about half an inch in diameter, and connected to the indicating apparatus by insulated copper leads, which may be of any convenient length. The indicating apparatus in the present case was placed inside the building at a distance of about 120 feet from the thermometers. It consists of a specially con-

structed mirror galvanometer, reading with a telescope and scale. The apparatus was adjusted in such a way that the scale reads direct in degrees Fahrenheit at the rate of 1 cm. to 1°. The scale is divided into millimetres on opal glass, and can be read by estimation to $\frac{1}{100}$ of a degree F.

Method of Taking Observations.

The thermometers are connected to numbered plugs, any one of which can be placed in a hole connected to the indicator. The current is turned on by a suitable switch, and the scale-reading taken and recorded to ·01° F. The readings thus taken require certain small corrections to reduce them to the true scale of the air-thermometer, but owing to the manner in which the galvanometer and the balancing resistances have been compensated for change of temperature, and in consequence of the accuracy of the adjustment of the thermometers, these corrections do not amount on the average to more than one-tenth of a degree Fahrenheit.

The observations have, in general, been taken by one of the observatory assistants; occasional observations have also been taken by Prof. McLeod and by Prof. Callendar, as a check upon the accuracy and as a test of the condition of the apparatus. From the various tests applied from time to time, it appears that the observations of different observers agree very closely, and that the probable error of a single observation is less than one-fiftieth of 1° F.

The apparatus is so arranged that the condition of insulation of each thermometer can be tested at any time, without disturbing it, by making a very simple change in the connections. No defect of any consequence has so far been observed. The insulation of nearly all the thermometers is about one thousand times as good as is actually required.

Location of Thermometers.

A trench about 3 feet wide and 9 deep was dug in the soil of the level ground of the gardens, exposing a vertical face on one side. Into this face of undisturbed soil holes were bored with a half-inch iron rod, kept in a horizontal position by means of a spirit level, at various predetermined depths. The thermometers were inserted into these holes to a distance of nearly 3 feet from the vertical face, beginning from the bottom. The lowest thermometer was inserted at 9 feet, the next at 5 feet 6 inches, the others at 40″, 20″, 10″, and 4″, respectively. The wires leading from the various thermometers to the building were buried side by side in a trench about 3 feet deep.

The ground where the thermometers are buried is covered with a layer of turf, and consists of loose light-brown sand of fairly uniform

composition to a depth of about 8 feet 6 inches. Below this, to a depth of about 30 feet below the surface, extends a bed of stiff blue clay. Water is always found in the sand for a certain distance above the blue clay. It is intended to sink a tube in the neighbourhood of the thermometers, with a float to indicate the variations of water level, from time to time.

A similar thermometer is also exposed on the surface of the grass for the observation of surface temperature, and another is placed in a screen of the usual pattern, four feet above the ground, to give the air temperature.

Description of the Isothermal Diagram. (Fig. I.)

The results so far obtained are recorded in the accompanying diagram. The abscissa of the diagram represents time, on the scale of one centimetre to one week. The ordinate represents depth, on the scale of one millimetre to one inch. The temperature, at any depth, at any time, is shown by drawing the isothermal lines for each degree Fahr. This is probably the most convenient way of showing the whole at one glance. The isothermal lines are plotted by drawing, from the observations for each day, the curve showing the variations of temperature with depth. From these curves it is easy to find the depth corresponding to each degree of temperature.

A curve giving the variations of daily mean temperature of the air above the ground, at the rate of one millimetre to 1° F., is also shown on the diagram, as well as the depth of snow lying (1 mm. to 1 inch), and the rainfall (1 cm. to 1 inch).[1]

From the 21st of October to the 3rd of November, the mean air temperature varied very little from 50° F.; the temperature of the soil, to a depth of 9 feet, was also nearly uniform, and lay, for the most part, between 49° and 50° F.

A heavy fall of rain (·85 inch) on November 3rd was followed by a rapid decrease of temperature, marking the onset of winter, on November 4th. The temperature of the surface soil fell very rapidly till November 10th, when the rate of fall was checked by a snowfall of 4 inches, which lay for three or four days. The ground was first frozen, at a depth of 4 inches, by a severe frost, on November 19th. From this date onwards the 4″ thermometer never rose above the freezing point till the end of the winter. The air temperature rose to nearly 40° F. for the latter part of this week, but the fall of temperature near the surface was accelerated in a marked manner by the fall of rain on November 23rd percolating through the half-frozen ground.

[1] For convenience of reproduction, the figures have been reduced to about half the scale of the originals.

During the next fortnight, which was dry, the fall went on steadily but slowly. The depth of partially frozen soil increased to 9 inches. The mean value deduced for the thermal diffusivity of the soil, from the observations between 20 and 66 inches, for the week December 2nd to December 9th, is ·0065 in C. G. S. measure.

The most remarkable and sudden fall of soil temperature throughout the winter began on December 12th, and was caused by a fall of rain, which melted two or three inches of snow, and percolated rapidly through the dry and partially frozen sandy soil to the level of the blue clay beneath. This fall differs entirely in character from that due to thermal diffusion, in being very rapid and nearly simultaneous at all depths. It was followed by a partial recovery in the upper layers of soil, due to thermal diffusion from beneath.

The next fortnight was dry, and the latter half cold. The ground being free from snow, became thoroughly frozen to a depth of 13 inches.

The first heavy snowfall (about 1 foot) occurred on December 27th from which date the ground remained covered with snow till April 11th. Such was the protective effect of the snow covering, that although the mean temperature of the next two days was 10° below zero, the cold did not penetrate any further into the soil. By the end of the next fortnight, in spite of a mean air temperature of 10° F., the isothermal of 30° F. had disappeared from the soil, and did not again reappear throughout the winter.

From this date onwards the depth of frozen ground slowly but steadily diminished. The upper thermometers remained nearly stationary. The lower thermometers fell slowly, with slight fluctuations, due probably to movements of underground water.

The final melting of the snow between April 7th and 14th was accompanied by heavy falls of rain. The water could not penetrate directly through the frozen ground, but found its way into the subsoil by devious routes. The effect was to produce a sudden fall in all the lower thermometers, the upper ones remaining unaffected. It may be noticed that on this occasion the deepest thermometer, in the blue clay, was the first to be affected, whereas on the previous occasion, December 13th, when the water percolated directly through from above, the thermometer in the blue clay was scarcely affected at all.

The final thawing of the ground took place at a depth of 10 inches on April 19th. The 10 inch thermometer, which had remained within less than a tenth of a degree of 32° F. for about two months previously, showed a depression of three-tenths of a degree when the thaw reached it; probably owing to the lowering of the melting point by salts dissolved in the accumulated surface water. The percolation of this water caused a slight simultaneous fall in the two thermometers next below.

The weather continued bright and sunny till the 22nd. The isothermal of 35° F. disappeared early on the 21st, and that of 40° F. penetrated to a depth of 20 inches by the 23rd. The rain of April 22nd was followed by several dull, cold days, without sun, which produced a marked retardation; but with the beginning of May summer began with a phenomenal wave of heat. By May 4th the isothermal of 40° F. had disappeared, and the buds of nearly all the trees showed signs of bursting into leaf. The higher isothermals crowd into the ground very rapidly. By May 10th the isothermal of 60° F. had penetrated to a depth of 10 inches, and that of 50° F. to a depth of nearly 30 inches. The thermometer at a depth of 5 feet 6 inches had risen 4° F., but that at 9 feet, in the blue clay, remained within a tenth of a degree of 41·5° F., showing no variation since April 17th.

Effect of Various Conditions on Soil Temperatures.

The foregoing observations, taken in conjunction with the isothermal diagram which they are intended to describe, illustrate very clearly a number of points in connection with changes of underground temperatures. Many of the results obtained are obvious, upon consideration, and have been observed previously; but some, perhaps, of the conditions affecting soil temperatures have not been before observed under equally favourable circumstances.

The protective effect of the surface covering of snow is very strongly marked. The thermometer lying undisturbed on the surface of the grass beneath the snow, afforded a means of observing the degree of protection more certain than has hitherto been obtained; and the results would appear to indicate that the protective effect is even more remarkable and important than the majority of meteorologists have been inclined to admit.

The effect of heavy rainfall in diffusing heat and equalizing temperature in porous soils, is well illustrated by some of the observations. The importance of this factor has been frequently shown, but it has also been frequently overlooked in discussions of the thermal diffusivities of various soils. It would, doubtless, be possible from a more continued series of observations to deduce the effect in terns of the rainfall; and also to determine changes of level of underground water, in many cases, by observing changes of temperature and of diffusivity of the soil; but this would require a somewhat larger number of thermometers.

The depth of frozen soil varies considerably in different years, according to the date and depth of the earlier falls of snow. By the aid of buried thermometers, it is easy to determine the depth to which the frost has penetrated at any time; it is also possible to observe the rate at which the ground thaws with considerable accuracy, and to predict with some certainty the date at which the ground will become finally thawed

through, and the heat will be able to penetrate into the subsoil. This must have a very marked effect on the vigour of the growth of trees, and on the flow of the sap, which is doubtless influenced as much by the temperature and condition of the soil about the roots as by the prevailing atmospheric conditions.

Diurnal Variations of Temperature in the Surface Soil.

Observations of the diurnal variations of temperature were taken, as soon as the ground began to thaw, at frequent intervals throughout the day and night. These are illustrated, for two typical periods of five days each, by the curves showing the variations of temperature of each of the four upper thermometers. It may be noticed that the curves are somewhat smoother than similar curves obtained with mercury thermometers. This is probably explained by the fact that the thermometers are laid horizontally, and are not disturbed in reading.

The first set of curves, Fig. 2, illustrates the period of thawing of the ground. The waves of the diurnal variation of the 4-inch thermometer have an amplitude of between six and eight degrees, with a maximum occurring at about 6 p.m. The amplitude is greatly affected by the clearness of the atmosphere, and would probably afford a convenient means of measuring the mean daily intensity of radiation. On April 20th, for instance, with no material variation in the air temperature, the maximum attained was considerably diminished by the presence of small cumulus clouds causing occasional obscuration of the sun. Similarly, on the night of April 21st the rate of fall, and the form of the curve were completely changed by a thin veil of cirrhus clouds, which checked the radiation.

At a depth of 10 inches the amplitude is reduced to about a quarter, and the phase still further retarded, the minimum occurring about midday.

At a depth of 20 inches the diurnal variation can still be traced, but does not usually amount to more than two or three-tenths of a degree F.

In Fig. 3, the variations of the air and surface temperature are shown, together with those of the 4-inch thermometer, for the five extremely hot days, May 6th to 10th. The observations of the air temperature were not sufficiently numerous to give a continuous record, but suffice to indicate the general nature of the changes. The surface thermometer, which had been lying on the top of the grass, beneath the snow-layer, throughout the winter, was, for these observations, laid in a horizontal hole bored at a depth of 1 inch.

It will be observed that the maximum surface temperature on clear days occurred at about 1 p.m., whereas the maximum air temperature occurred at about 3 p.m. This was, perhaps, due in some measure to partial shadows cast by trees in the neighbourhood, which fell on the

thermometers between 2 and 3 p.m. The surface temperature, however, is mainly dependent upon sunshine and radiation. Its variations are the cause rather than the effect of the variations of atmospheric temperature. The dependence of the range of surface temperature on radiation is illustrated by the diminished amplitude of the curves on Wednesday, May 8th. The night was cloudy, after a brief thunderstorm, and the sun did not come out strongly till about 1 p.m. The daily range of surface temperature was reduced from 18° to 8° F.

The curves show, as might naturally be expected, that the rate of rise of surface temperature due to sunshine, at this time of year is much more rapid than the rate of fall at night. The maximum in the case of the 4-inch thermometer occurs at about 6 p.m., and the minimum at about 8 a.m. ; the rise occupying 10 hours and the fall 14.

Fig. 4 shows the diurnal variations, for the same period, on a slightly larger scale, of the 4-inch, 10-inch and 20-inch thermometers. The curves illustrate, more clearly than the previous example, the retardation and diminution of amplitude of the waves of heat as they are propagated downwards into the soil. They illustrate, in addition, the changes of form which these waves undergo. The curve of temperature variation at the surface is not a simple harmonic or sine curve, but must be regarded as made up of a series of such simple curves, which are propagated according to the laws of conduction of heat at different rates and with different decrements. At a depth of 10 inches the form of the wave is considerably modified. The fall is now more rapid than the rise, and the crest of the wave shows, in some cases, signs of breaking into two. At a depth of 20 inches the form of the wave is very considerably affected by the variations of two or three preceding days. For instance, the small surface variation of the 8th, combined with the large variation of the 9th, produces a double wave in the curve on the 9th and 10th at a depth of 20 inches. To attempt, however, to analyse these changes completely would require a much more extended series of observations.

Record of Radiation.

The amplitude of the diurnal variation of the 4-inch thermometer may probably, as we have seen, be made to give a very convenient measure of the mean clearness of the atmosphere, or the intensity of radiation, for each day and night. It would not be difficult from a sufficiently long continued series of observations to disentangle the probably small effect of changes of air temperature from those of radiation pure and simple.

In a similar manner, the daily observations of the 20-inch thermometer, or of one buried at a convenient depth at which the amplitude of the diurnal wave begins to be negligible, might be made to give a conveniently integrated record of the rate at which the soil is gaining or

losing heat, especially at those periods of the year when the gain or loss is most rapid and important. This point is illustrated in Fig. 5, in which are shown together the curves obtained by plotting the daily observations of the 20-inch thermometer and the integrated curve of sunshine. It will be observed, on comparing the curves, that for every variation in the curve of total sunshine, starting from the date on which the ground was thawed, there is a variation in the temperature curve, at a depth of 20 inches, similar to the former, but taking place about a day later.

The temperature curve takes account of diminished loss of heat at night, as well as of increased absorption of heat by day. This is shown in many cases by slight differences between the curves, but most clearly by the rapid increase in steepness between the 4th and 10th of May, during which period the night radiation was checked by an almost continuous haze of cirrhus clouds.

The sunshine curve has been plotted by simply adding for each day the observed percentage of possible sunshine. The similarity of the curves would have been more striking if allowance had been made for the rapidly increasing altitude of the sun and length of the day. But there was not time to perform the reductions up to date. The effect of a dull day is nearly always shown to some extent in the reading of the 20-inch thermometer taken at noon on the following day, but the effect persists for two days. In some cases the effect on the second day is obscured by another hot day or by rainfall.

Methods of Determining the Thermal Diffusivity of the Soil.

The rate at which changes of temperature are propagated in any soil depends upon the value of a constant termed by Lord Kelvin the "thermal diffusivity," which is the ratio of the thermal conductivity k to the thermal capacity c of unit volume. Much attention has been devoted by Lord Kelvin, Principal Forbes, Professor Everett, Angström, and other men of science to the determination of this important constant for various soils by observations with underground thermometers. This constant has also been determined by direct laboratory experiments for various rock and soil materials by other experimentalists, and particularly by a committee of the British Association.[1]

The results with buried thermometers have generally been obtained by a comparison of the amplitudes and phases of the annual wave of temperature at different depths. As the committee point out, the values obtained by different observers for similar soils differ very widely among themselves, and do not agree as closely as might be expected with the results of direct experiment. This is, no doubt, partly to be explained by the difficulty of constructing accurate and suitable thermometers, which could be read without being disturbed. It would appear, how-

[1] B. A. Reports, 1881, p. 126.

ever, very likely that the discrepancies from year to year, and between similar soils in different localities, may be due to percolation of rain and movements of underground water, which are shown to have a very marked effect on the changes of temperature occurring at such depths. These factors might operate systematically in such a way as either to increase or diminish the annual ranges at any depth. They are, in any case, sufficient to explain the fact that the mean annual ranges at different depths do not agree with the geometrical series indicated by theory. Results founded on the annual range, even if extending over a considerable period of years, are necessarily liable to constant errors from these sources.

By making use of the diurnal wave, instead of the annual, it might be possible, by a proper choice of dates, to avoid such accidental disturbances, and to calculate the value for the surface soil under different conditions of moisture. To apply this method successfully, it would be necessary to analyse a large nnmber of such waves into their simple harmonic components, and apply the usual formulæ to each. Sufficient observations have not yet been taken, however, in the present case for the application of this method.

Direct Method.

A much simpler and more direct method, which can be applied to the observations at any date, without complicated and troublesome analysis, is the following. From the observations with the different thermometers at any, date a curve may be drawn showing the variation of temperature at different depths for that epoch. A series of such curves, taken as samples from the observations, are shown in Fig. 6. The area included between any two of these curves when multiplied by c, the thermal capacity of unit volume, gives the total quantity of heat absorbed per unit area by any stratum of the soil between the dates and depths for which the curves are taken. The quantity of heat per unit area which passes by conduction into any stratum of the soil at a depth x_1 in any time, is equal to the product of the thermal conductivity k and the mean temperature gradient $\left[\frac{dv}{dx}\right]_1$ at the depth x_1 throughout the interval of time considered. The quantity of heat absorbed by a stratum of soil between the depths x_1 and x_2 is therefore equal to $k\left\{\left[\frac{dv}{dx}\right]_1 - \left[\frac{dv}{dx}\right]_2\right\}$. The mean value of $\frac{dv}{dx}$, the temperature gradient at any depth, for any interval of time, is easily found by drawing tangents to the temperature-depth curves. By equating the two expressions for the quantity of heat absorbed, the value of the diffusivity $\frac{k}{c}$ is found. This process is ob-

viously equivalent to a graphic integration of the differential equation $k \frac{d^2v}{dx^2} = c \frac{dv}{dt}$, which is the mathematical expression of the law of diffusion of temperature.

Applying the method above described to the curves given in Fig. 6, and choosing depths in each case at which tangents can be drawn to the curves with tolerable certainty, we deduce the following values between the depths of 20 and 100 inches :

April 23rd to 29th ; $\frac{k}{c} = \cdot 00587$ C. G. S.

April 29th to May 5th ; $\frac{k}{c} = \cdot 00592$ C. G. S.

May 5th to May 10th ; $\frac{k}{c} = \cdot 00635$ C. G. S.

With these we may compare—

Dec. 2nd to Dec. 9th ; $\frac{k}{c} = \cdot 00648$ C. G. S.

between the depths of 20 and 66 inches.

These values agree more closely among themselves than those obtained from the observations on the annual range previously referred to. They are in equally close agreement with other results obtained for the same soil, in a similar condition, at different dates, during the fall and winter months. Rainfall, however, is found to raise the value of the diffusivity very considerably. Taking, for instance, the interval, April 21st to 23rd, including a fall of nearly half an inch of rain on the 22nd, we find for the mean value of $\frac{k}{c}$, between the depths of 15 and 100 inches, the much larger result, ·0110 C. G. S. The increase in the value found is no doubt due to percolation. A similar, and often very much larger, increase is observed in other cases to be due to rain, but time has not yet sufficed to reduce the observations to rule.

In order to determine by this method the diffusivity of the surface layers, in which the temperature is constantly and rapidly varying, a slight modification is required. By drawing tangents at any suitably selected epoch to the curves of diurnal variation, the instantaneous values of $\frac{dv}{dt}$ at different depths may be found. These are plottted in the form of a curve, with the corresponding depths as abscissæ, giving the rate at which the ground is absorbing heat at different depths. The integration of this curve between limits x_1 and x_2, when multiplied by c, gives the rate at which the stratum x_1 x_2 is absorbing heat. This is equated to k times the difference between the values of $\frac{dv}{dx}$ at the depths x_1 and x_2, obtained from the temperature depth curve corresponding to the same

epoch. The values obtained in this manner agree as closely as can be expected with those found for longer intervals at greater depths; but owing to the rapid variations of temperature in the surface layers, greater uncertainty attaches to the curves from which they are deduced.

The values of $\frac{k}{c}$ above given for the sandy soil of the McGill College grounds may be compared with the following results obtained by different observers for similar soils:

Authority.	Material.	Value of $\frac{k}{c}$
Lord Kelvin	Garden sand	·0087
"	Craigleith sandstone	·0231
Neumann	Sandy loam	·0136
Prof. Everett	Greenwich gravel	·0125
Angström	Sandy clay	·0057
"	Argillaceous sand	·0045
"	Coarse sand	·0094
Rudberg	" "	·0061
Quetelet	" "	·0072
B. A. Committee	Wet sand	·0144
"	Dry sand	·0036

The majority of the above results are deduced from buried thermometers, and include the effect of percolating water. The different results for "coarse sand" by Angström, Rudberg and Quetelet are deduced from observations *of the same thermometers in the same situation* during different years, and may be taken as an illustration of the divergence of results obtained from the annual range. The results of the B. A. Committee were obtained by direct laboratory experiments.

The condition of the sandy soil of the McGill College gardens was tested about the beginning of May. It was found to be powdery and nearly dry to a depth of 5 feet, increasing in wetness below that depth. This probably accounts for the higher value, ·00635, obtained from the observations between May 5th and 10th, which, from the nature of the curves, would be more affected by the wetness of the lower soil.

Botanical Aspect of the Investigation.

In connection with the observations on soil temperatures, it is proposed to conduct a series of studies relative to the progress of vegetation at different seasons, in order to establish, as nearly as may be, the relations of soil temperatures to the various phenomena of growth in plants.

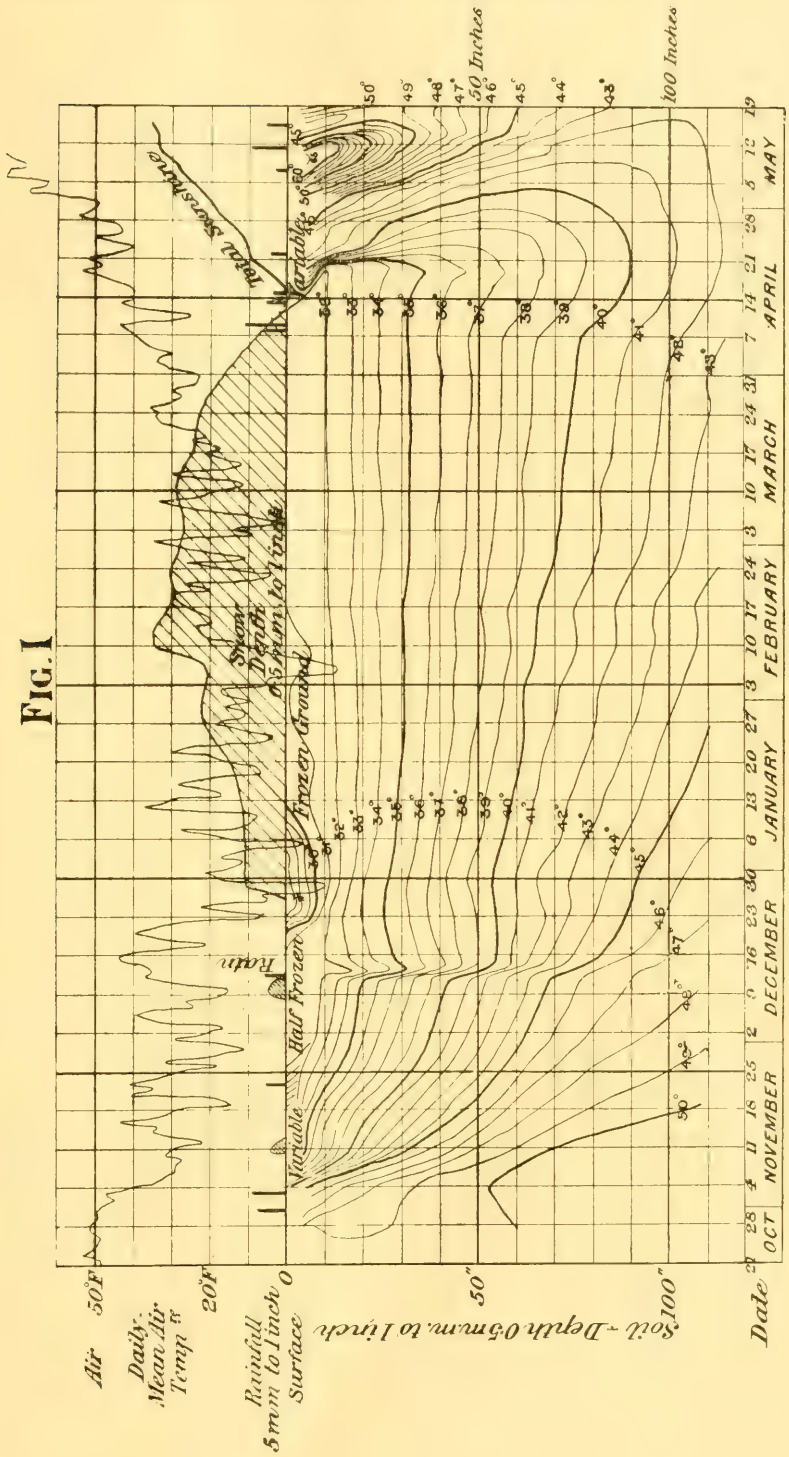
Much work has already been accomplished in this direction as the result of researches conducted elsewhere by Prof. Penhallow, who is now making a series of observations of a similar nature here. In this connection the importance of a continuous temperature record throughout the year, and particularly at the beginning and close of the vegetation period, should not be overlooked.

Conclusion.

We may conclude from the foregoing preliminary reduction of the observations that results of considerable meteorological and botanical interest might be readily obtained by the adoption of a similar method at many different localities and for longer periods of time. It would probably not be necessary to make the apparatus so elaborate and accurate as that in use at the McDonald Physics Building. It is possible to make a form of indicator reading to a tenth of a degree F., with which observations may be taken with greater ease and quickness than with mercury thermometers, and with at least equal accuracy. The same thermometers, in a slightly more sensitive form, reading with the same indicator, might also be readily applied to ordinary meteorological purposes. They are, for instance, particularly suitable for observing the temperature of the air at considerable heights above the ground, from which the initial rate of change of temperature with height, a factor of considerable importance, might be obtained.

The form of apparatus which it is proposed to adopt for these and similar purposes is here shown in action to illustrate the facilities which the method affords for the observation of temperatures with thermometers located in otherwise inaccessible situations. The cost of the thermometers is not greater than that of equally accurate mercurial instruments. The same indicator can be used with any number of thermometers, being placed in any convenient central situation in the observatory. The distance at which the thermometers are placed is a matter of no consequence, except in respect of the cost of the leading wires to the indicator.

ISOTHERMAL DIAGRAM.



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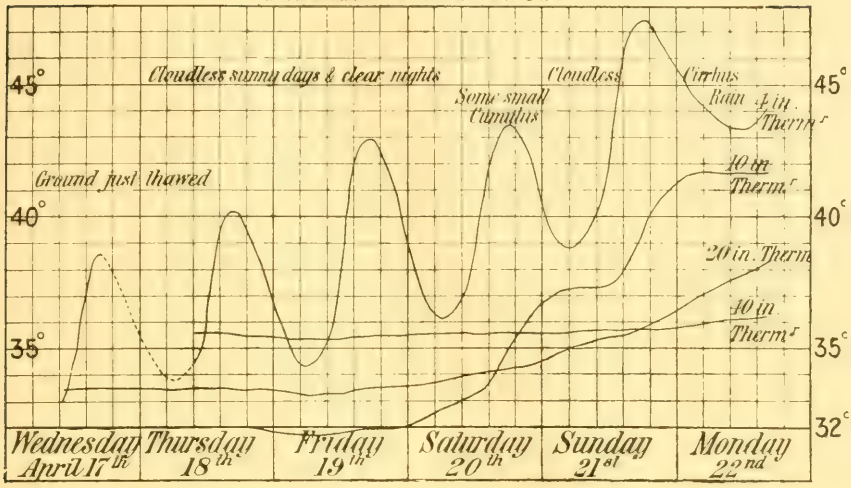
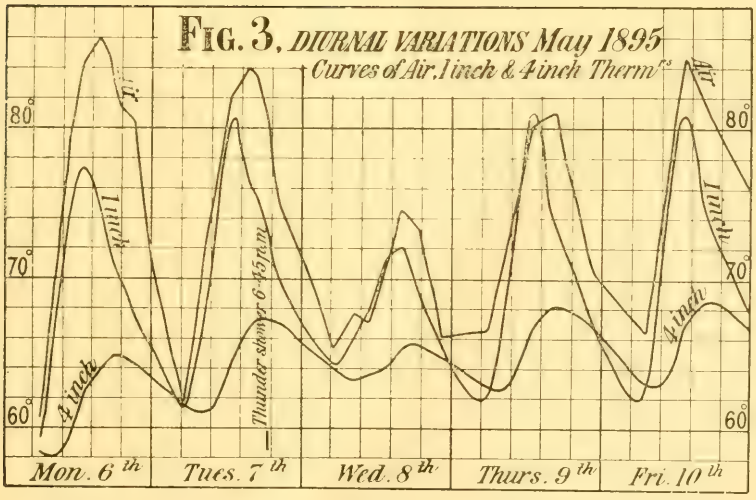
ASTOR, LENOX AND
TILDEN FOUNDATIONS.

FIG. 2

DIURNAL VARIATION





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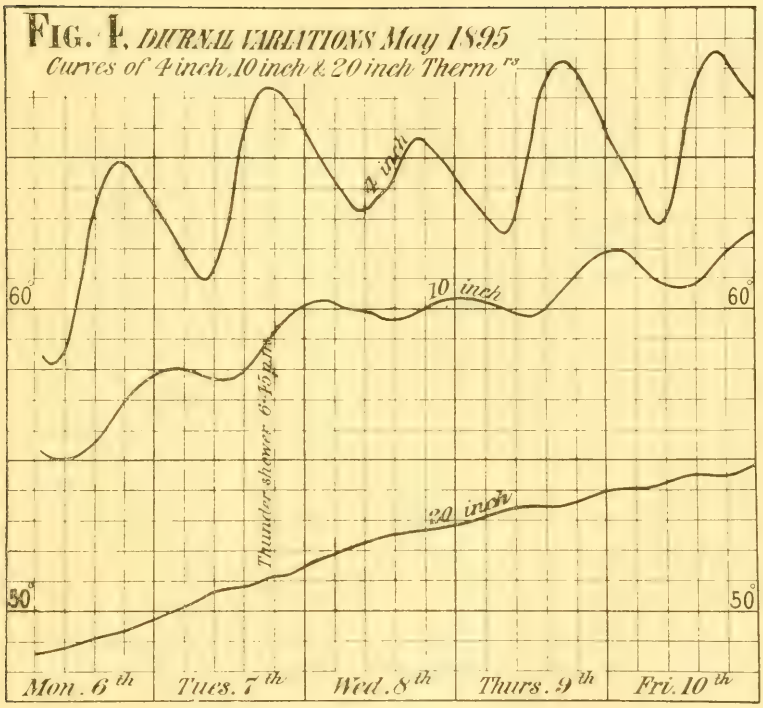
FIG. 1. DIURNAL VARIATIONS May 1895
Curves of 4 inch, 10 inch & 20 inch Therm^rs
4 inch
10 inch
20 inch
Thunder shower 6·45 p.m.
60°
60°
50°
50°
Mon. 6th
Tues. 7th
Wed. 8th
Thurs. 9th
Fri. 10th

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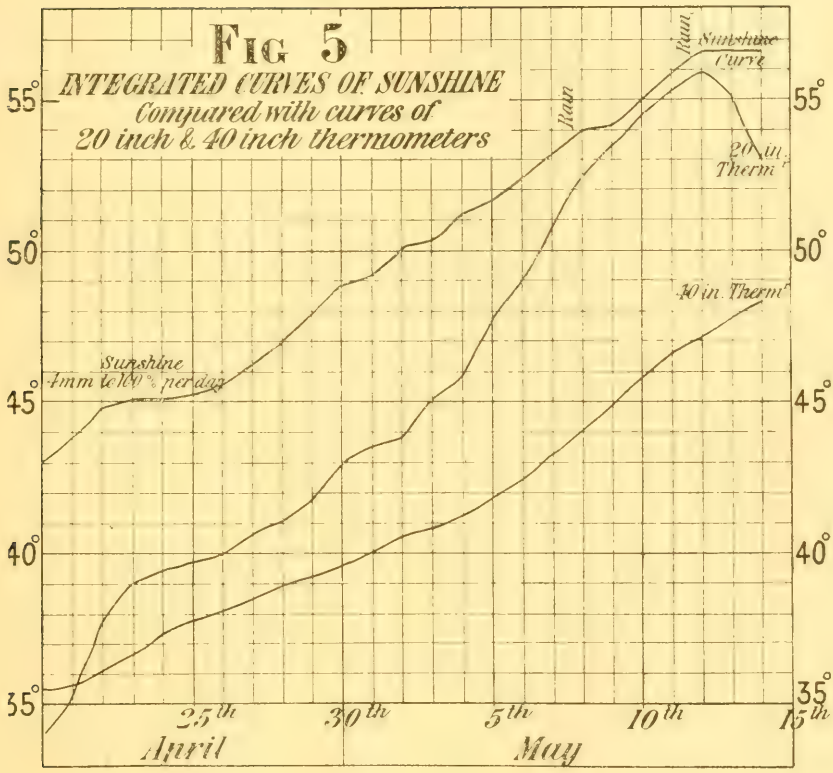
FIG 5
INTEGRATED CURVES OF SUNSHINE
Compared with curves of
20 inch & 40 inch thermometers
Rain
Sunshine Curve
20 in. Therm
40 in. Therm
Sunshine
1mm to 100% per day
55°
50°
45°
40°
35°
25th
30th
5th
10th
15th
April
May

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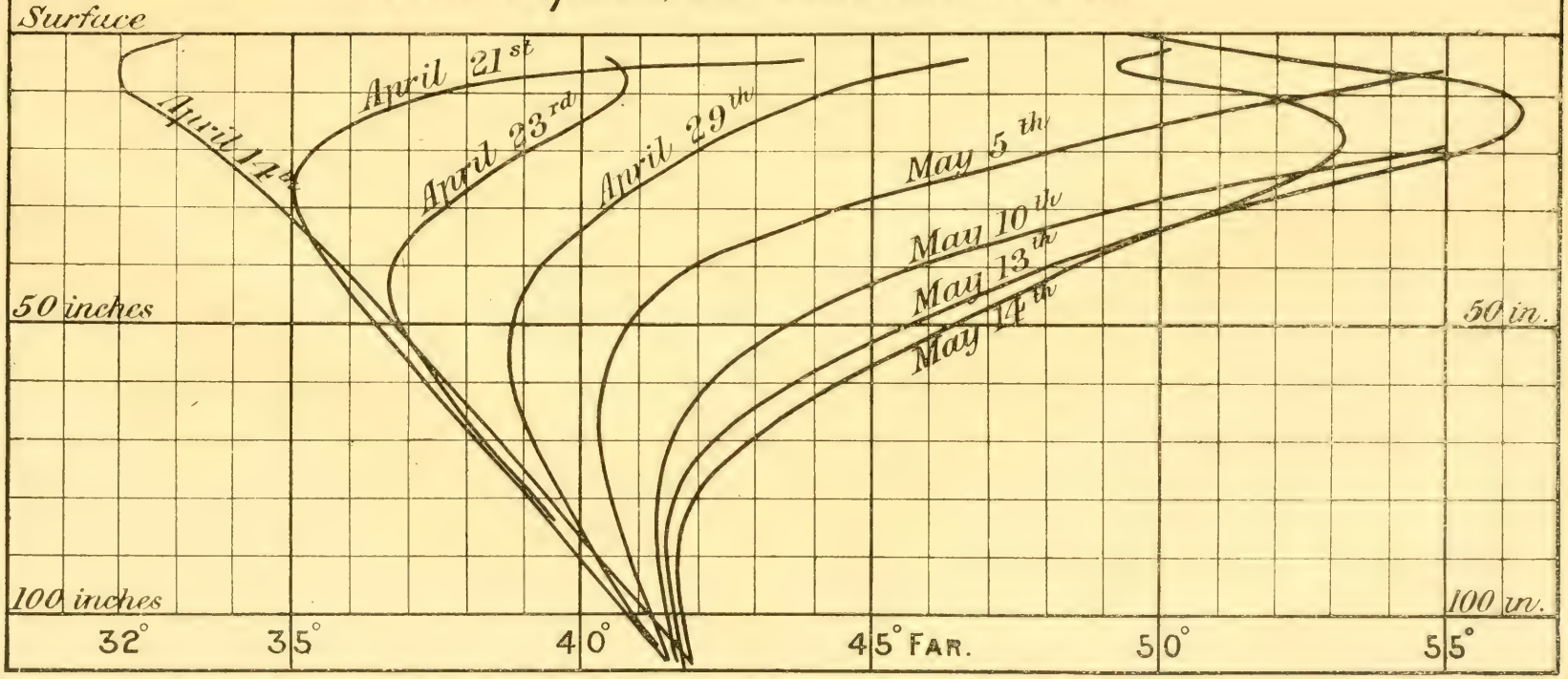
FIG. 6, *Curves showing the Variation of Temperature with Depth, at various dates.*



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VI.—*On the Hypotheses of Abstract Dynamics.*

By Prof. J. G. MACGREGOR, D.Sc., Dalhousie College, Halifax, N.S.

(Read May, 1895.)

In a paper which I had the honour of communicating to the Royal Society in 1892[1] I endeavoured to express in as precise, complete and simple a form as possible the hypotheses ordinarily employed in abstract dynamics. They were found to be as follows:

(1) *The Law of Force* (*Newton's Second Law of Motion*).—Relatively to any dynamical reference system, the acceleration produced in a particle by a force is proportional to the force, and has the same direction.

(2) *The Law of Stress.*—Natural forces may be considered to be attractions or repulsions whose magnitudes vary solely with the distance of the particles between which they act.

The usual mode of expressing the hypotheses, viz., in terms of force, was adhered to, partly because of its being usual, and partly because of its advantages from an educational standpoint. It was not maintained that this mode was logically superior to other modes, *e. g.*, to the expression of the hypotheses in terms of energy; it was simply held that if Newton's Second Law be adopted as one of the hypotheses, the above Law of Stress forms a simple, complete, and independent expression of the others.

The form in which the second hypothesis is given, although suited to the discussion of all problems in which bodies are regarded as consisting of particles acting on one another at greater or smaller distances, is not suited to the discussion of elastic solids and fluids when they are treated as continuous bodies whose elements exert forces on contiguous elements across their surfaces of separation, or to the discussion of what are apparently cases of action at a distance, on the assumption that the apparent action at a distance is really due to action through an elastic medium.

The discussion of elastic solids has been carried out both by means of the conception of action at a distance and by means of contact action; but the results obtained are discordant. As, therefore, it has not been found possible to carry out entirely satisfactory crucial experiments, it would appear that it must be regarded as an unsettled question which of the two methods is to be preferred. Nevertheless it has been held by Mr. Love that the molecular hypothesis ought to be discarded. "Even," he says, "if the experimental evidence were all fairly interpretable in

[1] Trans. R. S. C., vol. x., sec. iii., p. 3.

favour of the other side, if there were a general concensus that Cauchy's relations hold good and that Poisson's ratio is $\frac{1}{4}$ for materials carefully examined, that would not amount to a proof of the molecular hypothesis."[1] This must, of course, be admitted. Crucial experiments cannot prove an hypothesis; they can only disprove one of two rival hypotheses and increase the probability of the other. In the case supposed the molecular hypothesis would not be proved, but the rival hypothesis would surely be disproved.—"It would still be open to us," he continues, "to reject that hypothesis" [*i. e.*, the molecular] "as *not axiomatic.*" What is meant by axiomatic is not stated and is not made obvious by the context; but it is surely a remarkable statement that an hypothesis, which is admitted, for the sake of argument, to be capable of giving deductions satisfying the experimental evidence, is to be regarded as not axiomatic, while one which is similarly admitted to give results inconsistent with experiment is to be regarded as axiomatic. — "Modern physics," he says a little farther on, "is perfectly capable of deducing a theory of elasticity from the known laws of energy, without the aid of a subsidiary hypothesis about inter-molecular force, and being in that position, it is bound to discard the hypothesis." Now it is doubtless true that modern physics can do what is asserted of it, but only by substituting some other subsidiary hypothesis for that of molecular attraction. Mr. Love seems to admit this, for when he proceeds[2] to show that the conception of stress might be obtained independently of the molecular hypothesis, he says: "The existence of this stress might be taken as a fundamental fact, just as in elementary mechanics the tension of a string and the pressure of a fluid are taken as fundamental notions derived from experience;" and that he recognizes this to be merely the substitution of another hypothesis for that of the attraction of molecules seems to be shown by his remark: "As an example of a doctrine of stress derived from hypotheses other than molecular we may cite the theory of hydrodynamics." In fact, in addition to what are ordinarily called the hypotheses of dynamics, one or other of two additional assumptions is always made in dynamical discussions, —either that we may regard bodies as consisting of particles acting on one another at greater or smaller distances, or that we may regard them either as continuous or as connected by continuous media, the elements of the bodies or media exerting forces only on neighbouring elements across the surfaces of contact. Though not usually called distinct hypotheses, these assumptions are so in reality.

Since, then, modern physics can deduce a theory of elasticity from the laws of energy without the aid of a molecular hypothesis, only by substituting for it another hypothesis, it surely cannot be held that we are bound to discard the molecular hypothesis. The hypothesis which is

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[1] "Mathematical Theory of Elasticity," 1892, vol. i., p. 19.

[2] *Ibid.*, p. 67.

to be discarded is the one found to be inconsistent with fact, should it be possible to carry out a satisfactory crucial experiment, or, failing such experiment, the one found least useful in co-ordinating the phenomena of elasticity.

Whether or not I am right in thinking Mr. Love's position on this point untenable (and I shall return to this question later on), there can be no doubt that, since the conception of contact action is now widely applied, a statement of the hypotheses of dynamics ought to be such as would be applicable to cases in which bodies are regarded as continuous and their elements as acting directly only on elements in contact with them. It is, therefore, desirable to consider what modifications must be made in the above statement of hypotheses, in order to adapt them to the discussion of problems involving contact action.

The hypotheses ordinarily employed in the discussion of elastic solids on the contact-action hypothesis are Newton's Second and Third Laws and the law of the conservation of energy, As I have pointed out in the paper referred to above, however, the conservation of energy involves the Second Law of Motion, and is not, therefore, independent of it, the Second Law being necessary to prove that $\frac{1}{2}\, mv^2$ is equal to the kinetic energy. However convenient, therefore, for practical application, these laws form an illogical, because redundant, statement of the hypotheses employed. We have, therefore, to ask what independent hypotheses, in addition to Newton's Second Law, will enable us to obtain equations determining the motion of an elastic solid, including the law of the conservation of energy.

What these hypotheses are will be apparent from the following sketch of the reasoning by which this law may be obtained. It will be found in any treatise on elasticity that from Newton's Second and Third Laws alone we obtain the following as equations of motion:

$$\left\{\frac{\delta P}{\delta x} + \frac{\delta U}{\delta y} + \frac{\delta T}{\delta z} + \rho\left(X - \frac{\delta^3 u}{\delta t^2}\right)\right\} dx\, dy\, dz = o,$$

$$\left\{\frac{\delta U}{\delta x} + \frac{\delta Q}{\delta y} + \frac{\delta S}{\delta z} + \rho\left(Y - \frac{\delta^2 v}{\delta t^2}\right)\right\} dx\, dy\, dz = o,$$

$$\left\{\frac{\delta T}{\delta x} + \frac{\delta S}{\delta y} + \frac{\delta R}{\delta z} + \rho\left(Z - \frac{\delta^2 w}{\delta t^2}\right)\right\} dx\, dy\, dz = o,$$

where P, Q, R, S, T, U, are, according to the ordinary notation, the stress components at the point whose unstrained co-ordinates are x, y, z, and whose displacements are u, v, w; X, Y, Z, are the components of the body forces (per unit of mass) exerted at this point, and ρ is the density. To find the work done during the small increment of the strain, by which the component displacements u, v, w, are increased by du, dv, dw, we multiply these equations by du, dv, dw, respectively, add them, and integrate

throughout the whole volume. We thus obtain, after some purely kinematical transformations:

$$\iiint \left(\frac{\delta P}{\delta x} du + \frac{\delta U}{\delta y} du + \frac{\delta T}{\delta z} du + \frac{\delta U}{\delta x} dv + \frac{\delta Q}{\delta y} dv + \frac{\delta S}{\delta z} dv + \frac{\delta T}{\delta x} dw \right.$$

$$\left. + \frac{\delta S}{\delta y} dw + \frac{\delta R}{\delta z} dw \right) dx\, dy\, dz$$

$$+ \iiint \rho \left(X dx + Y dy + Z dz \right) dx\, dy\, dz$$

$$- \iiint \rho \left(\frac{\delta^2 x}{\delta t^2} \frac{\delta x}{\delta t} + \frac{\delta^2 y}{\delta t^2} \frac{\delta y}{\delta t} + \frac{\delta^2 z}{\delta t^2} \frac{\delta z}{\delta t} \right) dt\, dx\, dy\, dz = o.$$

This equation may now be shown, by the aid of mathematical theorems and without the employment of any dynamical assumptions in addition to those already employed, to be equivalent to the following:

$$\iint \left(F du + G dv + H dw \right) dS$$

$$- \iiint \left(P de + Q df + R dg + S da + T db + U dc \right) dx\, dy\, dz$$

$$+ \iiint \rho \left(X dx + Y dy + Z dz \right) dx\, dy\, dz$$

$$- \iiint d \left\{ \tfrac{1}{2} \rho \left[\left(\frac{dx}{dt} \right)^2 + \left(\frac{dy}{dt} \right)^2 + \left(\frac{dz}{dt} \right)^2 \right] \right\} dx\, dy\, dz = o.$$

where e, f, g, a, b, c are, according to the ordinary notation, the components of the strain, and F, G, H are the surface tractions at the element of surface dS.

It follows, from the ordinary definition of work done,[1] that the first term in this equation represents the work done by the surface tractions,

[1] The ordinary definition of work done by a force is the product of the magnitude of the force into the component displacement of its point or place of application in its direction; work done by a force when negative being called also work done by the body, on which it acts, against the force. As a displacement is necessarily relative, the value of the work done, according to this definition, is arbitrary, without the specification of a reference system. Prof. Newcomb, for this reason (Phil. Mag. [5], vol. xxvii., 1889, p. 115), proposed to define work done as "the product of the intensity of the force into the amount by which the two material points between which it acts approach to or recede from each other." The following objections may be made to this definition: (1) It is a definition of the work done by a stress, not of the work done by a force; and the latter, from which the former may be deduced, is too useful a conception to be abolished. (2) It is not a definition merely, but involves a dynamical hypothesis as well, viz., the Third Law of Motion; and hypotheses should be kept quite distinct from mere definitions. (3) It is applicable only in cases of action at a distance, being a particular form which the ordinary definition takes in such cases. Prof. Lodge, on the other hand (Phil. Mag. [5], vol. viii., 1879, p. 278), has proposed the following definition: "Whenever a body exerting a force moves in the

the second the work done by the internal stresses on the elements on which they act, and the third the work done by the body forces; and it may be shown, by the aid of the Second Law of Motion, that the fourth term represents the increment of kinetic energy. Hence the equation states that the work done by external forces (surface tractions and body forces) is equal to the work done by the internal stresses on the elements on which they act together with the increment of kinetic energy. If, therefore, the system be isolated so as to be acted upon by no external forces, we have:

$$\iiint \left(Pde + Qdf + Rdg + Sda + Tdb + Udc \right) dx\, dy\, dz$$
$$+ \iiint d \left\{ \tfrac{1}{2}\rho \left[\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2 + \left(\frac{dz}{dt}\right)^2 \right] \right\} dx\, dy\, dz = 0,$$

i. e., the work done by internal stresses, together with the increment of kinetic energy, must be zero.

If, after the occurrence of the small strain de, df, etc., the body be allowed to return to its initial state of strain, and if the values of the stress components during the unstraining are P', Q', R', S', T', U', work will be done by the elements against the stress components equal to—

$$\iiint \left(P'de + Q'df + R'dg + S'da + T'db + U'dc \right) dx\, dy\, dz.$$

Hence this expression will represent the work power which the body had gained because of the strain or the potential energy of the strain. In a finite strain the potential energy will be the integral of this expression between the final and initial configurations as limits

In order that the potential energy of a finite strain may be equal to the work done by the internal stresses during the strain, the above integral must be equal to the integral of

$$\iiint \left(Pde + Qdf + Rdg + Sda + Tdb + Udc \right) dx\, dy\, dz$$

between the same limits, whatever the series of infinitesimal strains by

sense of the force it exerts, it is said to do work; and whenever a body exerting a force moves in a sense opposite to that of the force it exerts, it is said to have work done upon it, or to do anti-work, the quantity of work being measured in each case by the product of the force into the distance moved through in its own direction." This is clearly equivalent to the ordinary definition in cases of contact action, but not in cases of distance action. If applied in the latter cases, theorems involving work done and working power or energy, which have been established in terms of the ordinary definition, would no longer hold. The law of the conservation of energy, for example, would have to be replaced by a more complex law of energy. Thus Lodge's definition is as unsuitable for distance action discussions as Newcomb's for those involving contact action. The ordinary definition has, therefore, the great advantage over both of being equally applicable to both classes of problems. (See a note on the "Definition of Work Done" in "Trans. Nova Scotian Institute of Science," vol. viii., p. 460.)

which the strain and the unstraining may be accomplished. In other words, P, Q, R, etc., representing the stress components at a point at which the corresponding strain components are e, f, g, etc., whether during the straining or the unstraining,

$$\iiint \left(Pde + Qdf + Rdg + Sda + Tdb + Udc \right) dx\, dy\, dz$$

must be an exact differential.

The condition that this expression shall be an exact differential is that

$$Pde + Qdf + Rdg + Sda + Tdb + Udc$$

itself shall be an exact differential, and, therefore, that P, Q, R, S, T, U shall be proportional to the rates of increase with respect to e, f, g, a, b, c, respectively, of a function of e, f, g, a, b, c, and of these quantities only. If, therefore, this condition be assumed to be fulfilled, the equation of work done for an isolated system becomes—

$$\iiint d\,V\,dx\,dy\,dz + \iiint d\left\{ \tfrac{1}{2}\rho \left[\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2 + \left(\frac{dz}{dt}\right)^2 \right] \right\} dx\,dy\,dz = o.$$

V being the potential energy per unit of volume; or if we indicate by P the potential energy and by K the kinetic energy of the body,

$$dP + dK = o;$$

and hence

$$P + K = \text{constant},$$

the law of the conservation of energy.

Hence the additional hypotheses which are required for the deduction of the conservation of energy are the Third Law of Motion and the hypothesis that the stress components at any point are proportional to the rates of increase, with respect to the corresponding strain components at the point respectively, of a function of these strain components only.

It is, of course, well known that, owing to the thermal changes accompanying strain and the variation of the stress-strain relations with temperature,

$$Pde + Qdf + Rdg + Sda + Tdb + Udc$$

is not in general for actual bodies undergoing actual strains an exact differential; but in abstract dynamics we ignore variation of temperature in the body, and consider only ideal perfectly elastic bodies strained in such a way that variations of temperature do not occur.

The equations of motion given above and the law of the conservation of energy, however, are not sufficient for the solution of even all general problems connected with elastic solids and fluids. It is frequently necessary to employ the equation of continuity, and it would thus appear at first sight that the treatment of continuous bodies requires still another hypothesis. The equation of continuity seems to be regarded usually as

an additional hypothesis. Thus (to cite a few works which happen to be at hand) Rankine[1] expressly formulates the principle of continuity as an axiom; Kelvin and Tait,[2] Minchin,[3] Lord Rayleigh,[4] and Greenhill[5] deduce the equation from the impossibility of the annihilation and the creation or generation of matter; Duhamel,[6] Besant,[7] and Bassett[8] obtain it from the continuity of the motion of a fluid; while Poisson,[9] Schell,[10] Kirchhoff,[11] Besant,[12] Lamb,[13] who regards it as "a kinematical relation obtained by expressing the constancy of mass," and Tait,[14] who regards it as "the mathematical expression of the fact that the number of points" [of a deformable figure] "is not altered" by deformation, all obtain it more or less clearly from the constancy of mass, which is asserted or assumed to be evident or obvious.

That the equation of continuity involves no assumption in addition to those introduced above, however, may readily be shown. Why it is needed in the solution of many problems becomes apparent when we note that in obtaining the equations of motion the Second Law of Motion is only partially applied. That law tells us that the quotient of the force acting on a body by the acceleration it produces is constant, the value of the constant being called the mass of the body. Now, in obtaining the equations of motion given above, the sum of the components in the x axis of the forces acting on the element $dx\ dy\ dz$ is put equal to $\rho \frac{\delta^2 u}{\delta t^2}\ dx\ dy\ dx$, $\rho\ dx\ dy\ dz$ being the mass of the element; and similarly for the y and z axes. There is thus nothing in the equations to express the constancy of the quotient of force by acceleration; the Second Law of Motion is thus only partially applied, and for a complete application of it an additional equation is necessary, viz., the statement in some form or other that the $\rho\ dx\ dy\ dz$ of the equations of motion is constant. Thus the equation of continuity involves no hypothesis in addition to those mentioned above. It is simply a partial application of Newton's Second Law, which, together with the partial application of the same law made in obtaining the equations of motion, constitute a complete application of the law.

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[1] "Applied Mechanics," 9th ed., p. 411.
[2] "Treatise on Nat. Phil.," vol. i., part 1, § 191.
[3] "Uni-planar Kinematics of Solids and Fluids," 1882, p. 142.
[4] "Theory of Sound," 1878, vol. ii., p. 3.
[5] "Encyclopædia Britannica," 9th ed., art. Hydromechanics, p. 445.
[6] "Cours de Mécanique," 3me ed., 1863, tome ii., p. 284.
[7] "Hydro-mechanics," 3rd ed., 1877, p. 168.
[8] "Hydro-mechanics," vol. i., 1888, p. 7.
[9] "Traité de Mécanique," 2me ed., 1833, tome ii., p. 669.
[10] "Theorie d. Bewegung u. d. Kräfte," 1870, p. 939,
[11] "Mechanik," 2te Aufl., 1877, p. 129.
[12] "Hydro-mechanics," 3rd ed., 1877, p. 170.
[13] "Mathematical Theory of the Motion of Fluids," 1879, p. 5.
[14] "Encyclopædia Britannica," 9th ed., art. Mechanics, § 94.

The other equations required for the solution of problems in elastic solids and fluids, such as equations giving the relation of the stress components to the strain components, the relation of pressure to density, etc., are furnished by physical dynamics. So far as abstract dynamics is concerned, they are merely definitions of the kind of body with which we may be dealing.

We have thus seen that, in the discussion of perfectly elastic bodies of invariable temperature, by means of the conception of contact action, in order to obtain the equations of motion, the equation of continuity and the conservation of energy, we employ two hypotheses, in addition to the Second Law of Motion, viz., the Third Law of Motion and the hypothesis that the stress components at any point are proportional to the rates of increase, with respect to the corresponding strain components at the point respectively, of a function of these strain components only.

These two hypotheses together, it will be noticed, constitute a general specification of stress, the Third Law asserting the equality and opposition of the forces which constitute it, the other hypothesis stating upon what the magnitude of these forces depends. They may thus be conveniently combined in one by defining a stress as a pair of equal and opposite forces acting between two contiguous elements of a body and estimated per unit of area of the surface across which they act, and by asserting that the stresses developed in an elastic body by a strain depend upon the strain in the way just specified.

Hence, in cases in which the conception of contact action is employed in abstract dynamics, as well as, according to the conclusion reached in the paper cited above, in cases in which forces are regarded as actions at a distance, the hypotheses may be considered to be two, which in cases of contact action are as follows:

(1) *The Law of Force:* Newton's Second Law of Motion.

(2) *The Law of Stress:* The stresses between the elements of a continuous body, which are called into play when it undergoes strain, are such that their components are proportional to the rates of increase, with respect to the corresponding strain components respectively, of a function of these strain components only.

In the treatment of elastic solids and fluids the internal stresses are frequently regarded as contact actions, while the body forces are regarded as distance actions. In such cases, if Newton's Second Law be employed as one hypothesis, the law of stress will require to be applied in its two forms—that suitable for contact actions, and that suitable for distance actions. But in any case which is treated as a case of purely contact action, or of purely distance action, only the appropriate law of stress will be required in addition to Newton's Second Law.

It will be noted that the law of stress in the case of contact action is more complex in expression than the corresponding law in the case of

distance action. This arises from the fact that, as pointed out in my former paper, the law of stress, which is very generally, if not universally, employed in cases of distance action, is more than sufficient for the deduction of the conservation of energy. In such cases, if S_{12}, S_{13}, S_{23}, etc., be the stresses between the particles, m_1 and m_2, m_1 and m_3, m_2 and m_3, etc., and if s_{12}, s_{13}, s_{23}, etc., be the distances between these pairs of particles respectively, the deduction of the conservation of energy requires only that

$$S_{12}ds_{12} + S_{13}ds_{13} + S_{23}ds_{23} + \text{etc.},$$

shall be a complete differential, which again requires only that the stresses shall be proportional to the rates of change, with respect to the corresponding distances, of a function of the distances of all the pairs of attracting or repelling particles of the system. But it is generally assumed that each stress is a function of the distance between the particles between which its acts, and of this distance only. This assumption makes each term of the above expression an exact differential. It was shown in my former paper that the additional assumption thus introduced, over and above that required for the deduction of the conservation of energy, may be regarded as the "physical independence" of stresses, *i. e.*, that the stress between any two particles of a system is independent of the stresses between them and other particles.

Were it not for the employment of this additional assumption in problems treated as cases of distance action, it would be possible, by a suitable extension of the definitions of stress and strain, to express the law of stress in a way which would be applicable both to the contact action and to the distance action modes of treatment. Such simplification, however, would be of doubtful utility. But it is obviously of some importance that we should recognize that if Newton's Second Law be employed as one of the hypotheses of dynamics, then, whether we employ the conception of action at a distance or of contact action, only one other hypothesis is necessary, and one other is sufficient, for the purposes of abstract dynamics, viz., one which gives a general specification of the stresses which occur in nature. And it is of importance also to notice that in applications of the molecular conception of the constitution of bodies, an additional assumption has generally been employed over and above what are necessary for the deduction of the general equations of motion and of the law of the conservation of energy.

To sum up, then, the following may be said to be a complete statement of the independent hypotheses necessary and sufficient to give the general equations of motion and the law of the conservation of energy, Newton's Second Law of Motion being taken to be one of them :

I. In Cases of Contact Action.

(1) *The Law of the Constitution of Bodies.*—Bodies (including media by which bodies commonly so called may be supposed to be connected)

may be considered to be continuous, their elements exerting forces only on neighbouring elements at surfaces of contact.

(2) *The Law of Force* (*Newton's Second Law of Motion*).—Relatively to any dynamical reference system, the acceleration produced in a body by a force is proportional to the force, and has the same direction.

(3) *The Law of Stress.*—The stresses called into play by a strain are such that their components at any point are proportional to the rates of increase, with respect to the corresponding strain components respectively, of a function of the strain components at the point.

II. In Cases of Action at a Distance.

(1) *The Law of the Constitution of Bodies.*—Bodies may be considered to consist of particles exerting forces upon one another at a distance.

(2) *The Law of Force.*—As above.

(3) *The Law of Stress.*—The stresses between the particles of a system are proportional to the rates of increase, with respect to the distances of the particles between which they act respectively, of a function of the distances of all the pairs of particles of the system, and of these distances between which stresses act.

The Law of Stress usually employed in cases of action at a distance, however, is as follows: The stresses between the particles of a system are functions of the distances of the pairs of particles between which they act respectively, and of such distances only; and this hypothesis differs from the one given above, which is both necessary and sufficient for the deduction of the law of the conservation of energy, by involving in addition the hypothesis of the physical independence of stresses, viz., that the stress between any pair of particles of a system does not depend in any way upon the other particles of the system.

It seems to have escaped the notice of the opponents of the molecular mode of treating elastic bodies that those who have used it have made this additional assumption. Love[1] sums up their objections as follows: "The opponents of the theory urge against it, firstly, that it rests on a hypothesis possibly doubtful; secondly, that this hypothesis has been incorrectly worked out; thirdly, that it contradicts the results of experiment; and, lastly, that the known laws of energy lead to results which are certainly true, whether the molecular hypothesis be correct or no, and these laws are sufficient to serve as a basis for theory." There is here no distinction between the molecular conception itself and the assumptions which have been made in applying it. It is not pointed out that the logical content of the assumptions made by those who have applied it is greater than that of the assumptions used in employing the contact-action conception, and that, therefore, the deductions from it

[1] "Treatise on the Theory of Elasticity," vol. i., p. 15.

must be less probable than the results of the contact-action treatment. It is implied that the assumptions which the molecular theorists have employed are the only ones consistent with that hypothesis. Accordingly Mr. Love sums up in favour of the contact theorists, saying that we must discard a subsidiary hypothesis about molecular force. He thus condemns the molecular conception itself, not merely the particular assumptions which have been employed in applying it. He also expresses approval of the contact-action conception, on the ground that the laws of energy (the assumptions which have been employed in applying it) are "known," and the deductions from it therefore "certainly true." We cannot, however, assert that "the known laws of energy lead to results which are certainly true," when applied by the aid of the contact-action conception. We must add: provided we are justified in using the contact-action conception. Were these laws applied by the aid of the molecular conception, without the employment of any additional assumption, we should have an equal right to assert that the results must be true, there being no criterion whereby we can judge of the relative merits of the contact action and the molecular conceptions, respectively. But obviously the results of both modes of discussion must be doubtful till we are sure of the applicability of one or the other or both, of the rival conceptions.

It would, therefore, be of great interest to work out the theory of elasticity from the molecular point of view without making the additional assumption of the physical independence of stresses, assuming only the laws of the conservation and of the transformation of energy, or their logical equivalents, as specified above. If it were found impossible to elaborate the theory with these assumptions only, then the molecular conception would be shown to be inferior in utility to the contact-action conception. If it were found capable of elaboration, and to give results differing from the results obtained by the contact-action conception, then crucial experiments might decide which of the two conceptions is inapplicable. But crucial experiments at present, should they decide in favour of the contact-action results, could show only that the molecular conception, with the additional assumption, gives false results, and it would still be doubtful whether the error was due to the conception itself or to the additional assumption made in applying it.

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VII.—*Viscosity in Liquids, and Instruments for its Measurement.*

By ANTHONY MCGILL, B.A., B.Sc., Assistant Analyst, Inland Revenue Department.

Presented by Thomas Macfarlane, Esq., F.R.S.C., Chief Analyst, etc.

(Read May, 1895.)

This paper is, in large part, historical, and sketches the progress of viscosimetric work, giving some account of the nature of the results obtained, and the various forms of instruments which have been devised and employed. These latter are, for purposes of study, classified as follows:

Class I.—Instruments designed for the determination of true viscosity, *i.e.*, internal fluid friction.

Class II.—Instruments whose operation depends upon the surface tension and the density, rather than the true viscosity of the liquids examined.

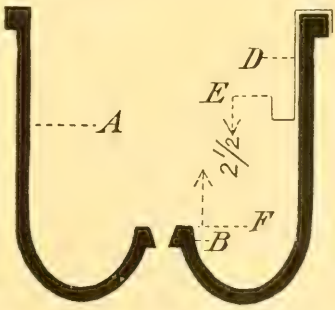
Class III.—Efflux instruments in which a constant head of pressure is maintained during flow.

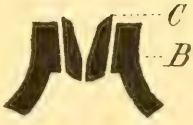
Class IV.—Efflux instruments working under varying pressure.

Class V.—Mechanical devices for testing the lubricating qualities of oils under conditions more or less similar to those obtaining in actual use.

Class VI.—Viscosity apparatus not belonging to any of the former classes.

Under Class IV., the following record of work done with an instrument designed by the author of the paper occurs:





A is a cylindrical vessel of brass, five inches in each dimension; B is a re-entering cone, $1\frac{1}{4}$ inches high, 1 inch diam. below and $\frac{1}{2}$ inch at top. Into this are fitted (by ground joints) the nozzles C, as shown enlarged in the lower figure. D is a strip of bent copper to serve as a gauge. The vertical distance between the points E and F is $2\frac{1}{2}$ inches.

The brass vessel is cast in one piece and shaped on the lathe; its walls are one-quarter of an inch thick. The large size of the cup enables it to contain 1,200 cc. of oil at the beginning of each test. The small portion (50 cc.) withdrawn flows at a practically uniform rate throughout the

time the experiment lasts, since the large horizontal area of the vessel makes the variation of rate due to gravity to be insignificant. The oil is withdrawn from the middle of the whole quantity contained in the vessel, and although the outer layers of oil may slightly change their temperature, the middle portion is sensibly constant during the time of the test. The tubulure (I used at first the agate tube from the Redwood instrument, but now it is replaced by nozzles of phosphor-bronze bored to $\frac{1}{32}$, $\frac{2}{32}$, $\frac{3}{32}$ inch respectively) is not placed at the bottom of the vessel; consequently particles of dust, sand, etc., which may be accidentally present, do not interfere with the working. Finally, the shape of the conical tube carrying the agate makes it very convenient to insert the receiving flask, whose neck fitting somewhat closely into the hollow cone prevents the cooling effect of air currents upon the mouthpiece, a very important consideration, since they constitute an unascertainable and a varying factor in the results obtained with other instruments. I employ a ring burner in heating the oil, and a wooden spatula for stirring it. It is convenient to use two flasks, so that one may be draining while the other is in use. In this way a very large number of experiments may be made, even at high temperatures, in a short time.

The following results illustrate the working of this instrument using a cylinder oil:

Temp.	No. of Tests.	Max.	Min.	Mean.
250° F.	11	34·0 sec.	33·0 sec.	35·5 sec.
200° F.	16	45·3 "	44·5 "	44·8 "

In order to determine the change in the rate of flow due to lowering of the level, I made series of tests taking, in each case, three successive portions of 50 cc. The initial level is always $2\frac{1}{2}$ inches above the upper surface of the nozzle:

1. Temp. 250° F. (means)—

	1st, 50 cc.	2nd, 50 cc.	3rd, 50 cc.
	33·5 sec.	34·7 sec.	36·0 sec.
At 200° F.—	44·8 sec.	47·2 sec.	50·6 sec.

The withdrawal of 150 cc. causes the level to fall about three-eighths of an inch, corresponding to an increase in time of about $2\frac{1}{2}$ seconds at 250° F., and about $5\frac{1}{2}$ seconds at 200° F., a guarantee that any slight error in the adjustment of original level can have but a very trifling effect on the rate of flow. The following experiments were made with a sample of glycerine diluted to the density of Redwood's standard rape oil, viz., 1·226 at 15·5° C.

The temperature of the laboratory was 68° F., and I found it quite

easy to keep the temperature of the oil constant to within 0·5 degree during the time of the experiment :

No. Expts.	Temp.	Max.	Min.	Mean.
5	60·0° F.	313·5	310	311·7 sec.
5	60·5° F.	308·4	306	307·0 "
7	61·0° F.	305·0	300	302·1 "
6	70·0° F.	209·0	205	207·0 "
4	75·0° F.	166 0	164	165·0 "

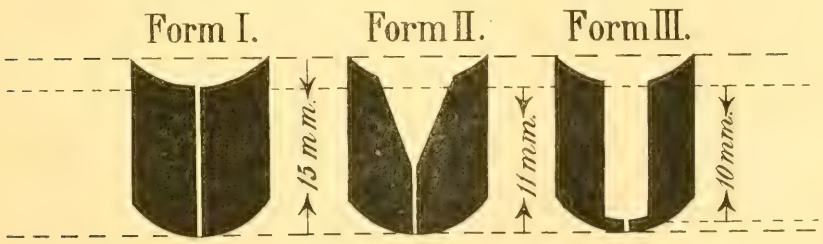
The above represent consecutive series of tests, and illustrate the extremes of experimental error.

It should be mentioned that the above experiments were made with my viscosimeter in its original form, employing the Redwood nozzle.

Among the characters which this instrument has to recommend it are these : (1) That it is made without soldered or brazed joints, and can therefore be used with safety at the highest temperatures to which liquids can be raised without decomposition or volatilization ; (2) The temperature of the liquid in the centre of the mass contained in the vessels is constant, even at high temperatures, to within 0·5° C. for at least 200 seconds, thus permitting the use of a capillary tube at these temperatures ; (3) The nozzles are easily changed, even when the liquid is very hot ; (4) The instrument is easily cleaned, and has so few parts that it is easily kept in working order.

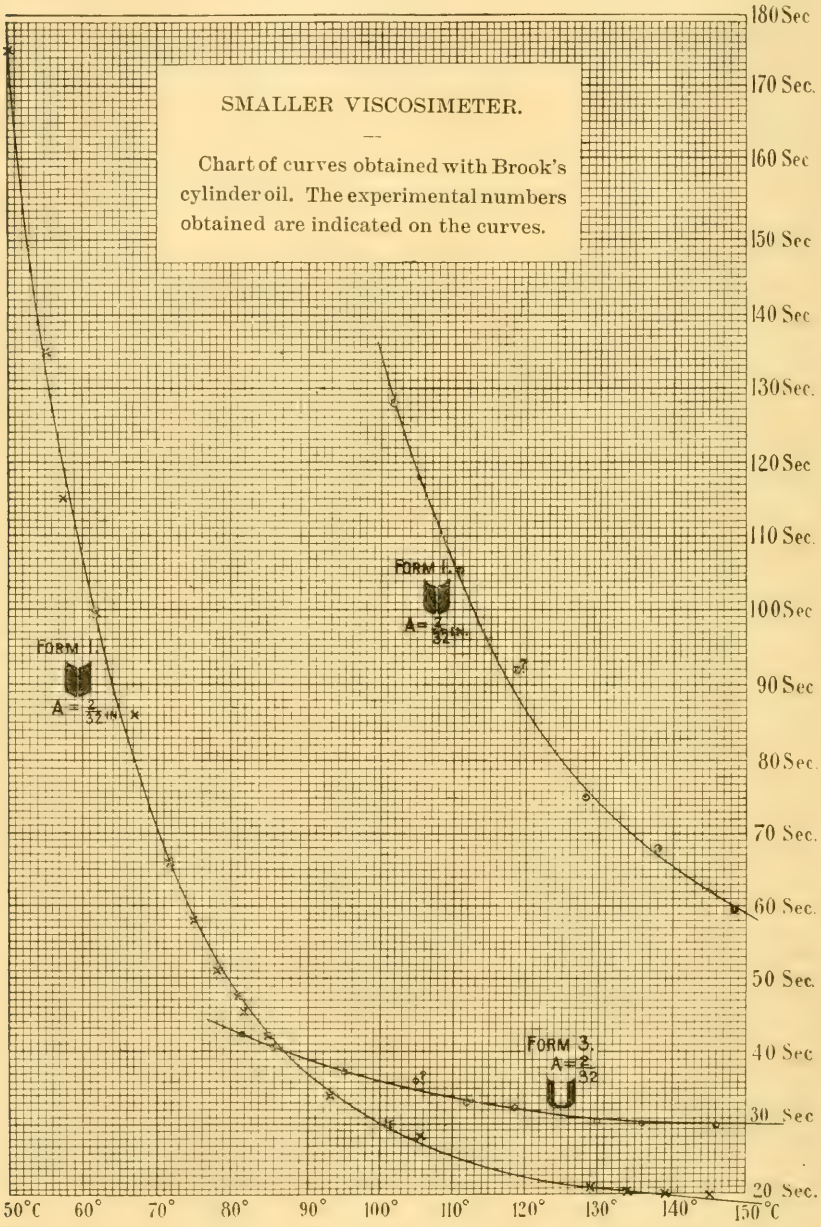
In order to be able to work with a smaller volume of liquid I have had a smaller instrument made, using the same nozzles as the first, but of 3 instead of 5 inches diameter. In consequence of this it can be operated with 410 cbc. instead of 1,200 cbc.; and from work which I have done with it I am satisfied that when the time of efflux is not too long, its readings are practically identical with those of the larger instrument.

The nozzles are made in three different forms, as follows :



and each form is made in three sizes, viz., $\frac{1}{32}$, $\frac{2}{32}$ and $\frac{3}{32}$ inch diameter. It is not unlikely that the indications given by an orifice of Form I., may have a higher practical value, in certain cases, than those given by the other forms, since interior friction is a larger function of flow in this form ; while, in Form III., which amounts to a thin plate, the indications may be of special value in yet other cases.

It is evident, from a glance at the accompanying curves plotted from experiments with a cylinder oil, that we are dealing with quite different sets of molecular forces when flow takes place through these two forms of outlet.



For a particular set (A) of these nozzles, the times of efflux for water at 20° C., were as given in the following table. The numbers are means of numerous closely concordant experiments :

Series A.			Form I.		Form II.		Form III.	
Temp. 20° C.	Diameter of Nozzle.		50 cbc.	100 cbc.	50 cbc.	100 cbc.	50 cbc.	100 cbc.
Distilled Water..	$\frac{1}{32}$ inch	1st 2nd	122·4 125·9	248·3	93·0 96·5	189·5	79·1 82·4	161·5
	$\frac{2}{32}$ inch	1st 2nd	30·9 31·8	62·7	27·0 27·7	54·7	24·6 25·3	49·9
	$\frac{3}{32}$ inch	.....	.....	24·8	.....	22.8	.....	22·4

In sizes $\frac{1}{32}$ and $\frac{2}{32}$ inch the time of flow was taken for successive volumes of 50 cbc. ; and it will be noted that the difference due to change of *head* is practically constant for the same size of orifice, being 3·5 sec. and 0·8 sec. respectively.

The nature of the forces producing flow changes with the absolute size of the outlet, as well as with its shape. This is evident from the following time-ratios, in which the time of flow through Form I is taken =100 :

	Form I.	Form II.	Form III.
Size $\frac{1}{32}$.....	100	76·3	65·0
" $\frac{2}{32}$.....	100	87·2	79·6
" $\frac{3}{32}$.....	100	91·9	90·3

It appears from this that the influence of the form of the nozzle is less as the diameter becomes greater.

The influence of an increase in diameter upon the time of flow is practically a constant whatever form of the nozzle is employed. Thus, taking the time of flow for size $\frac{1}{32}$ as 100, we have :

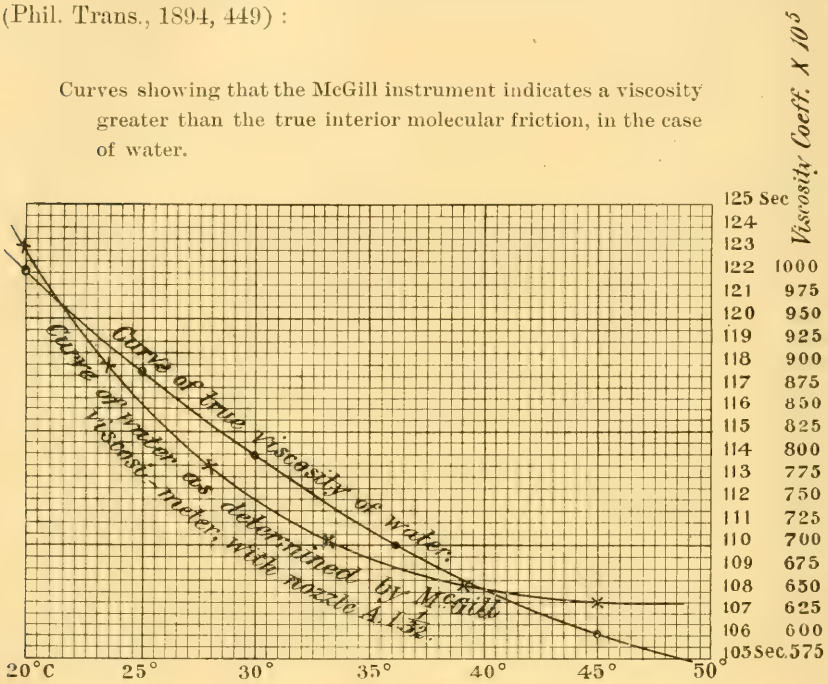
	Size $\frac{1}{32}$.	Size $\frac{2}{32}$.	Size $\frac{3}{32}$.
For Form I.....	100	25·3	10·0
" " II.....	100	28·8	12·0
" " III.....	100	30·9	13·9

From this study it seems that both the form and size of the jet are functions of the rate of flow.

I had hoped to be able to show the relations between the curves of true viscosity, and those of viscosity as shown by this instrument, in the cases of water, alcohol, chloroform, and some other liquids whose curves

of internal friction have been accurately determined, but I have not found the necessary leisure for this investigation. In the following table is given a curve for water between 20° and 45° C. The number of seconds for delivery of 50 cbc. with nozzle A, I $\frac{1}{32}$, and also the viscosity co-efficients $\times 10^5$ are taken as ordinates, and the temperatures as abscissæ. The absolute viscosity numbers are from a table by Thorpe and Rodger. (Phil. Trans., 1894, 449) :

Curves showing that the McGill instrument indicates a viscosity greater than the true interior molecular friction, in the case of water.



I propose to investigate the following points :

1. The relations to each other of the curves of viscosity as obtained with nozzles I., II. and III.

2. The interpretation of these curves in terms of interior friction, etc.

3. The limiting temperatures at which the viscosity of oils, etc., may be profitably made for practical purposes.

4. The advantages, if any, in expressing results by a curve instead of by absolute values obtained at definite temperatures.

5. The desirability of working with a suite of nozzles when carrying on viscosity tests through a long range of temperature.

6. The maximum and minimum deviation of single tests, with a view of rendering errors of experiment in reading, change of temperature, volume delivered and time of flow, so small as to be negligible.

7. The advantage, if any, of working with a standard head of pressure. The effective head is 3 inches. Is it desirable to take a 3-inch head of water as a standard, and to take the level for other liquids inversely as their density, so that

$$\text{head in inches} = \frac{1{,}000}{d} \times 3$$

when d is the density of the liquid ?

I have arranged the index which marks the level of the liquid in such a way that this change of level can easily be made if found decirable.

ROYAL SOCIETY OF CANADA

TRANSACTIONS

SECTION IV.

GEOLOGICAL AND BIOLOGICAL SCIENCES

PAPERS FOR 1895

I.—*Presidential Address: Practical Entomology.*

By JAMES FLETCHER, F.L.S.

(Read May 15, 1895.)

INTRODUCTORY.

Undoubtedly a noticeable feature of the last decade has been the general recognition of the value of science,—that is, accurate knowledge—in carrying on all the ordinary occupations of life. The foolish ideas that science is a sort of wonderland, not to be entered except by a favoured few, or that science as a study must not be popularized for fear of degrading it, are now only held by the ignorant or those who are unwilling to learn. Science is, merely, accurate knowledge in all branches of study, and the popularizing of science means only the rendering of such knowledge so simple or accessible as to be available to all who wish to learn.

Strenuous efforts are now being made by the leading thinkers in all lines of study, to give their investigations a practical application to the every-day affairs of life. In no direction have these efforts been attended with so much success as in what are called the natural sciences. Recent developments in the application of electricity may well be said to have revolutionized the whole systems of transportation and communication, as well as the lighting of cities and individual buildings, and offer a most attractive field for discussion by any scientific body. Perhaps I need not crave your indulgence for drawing your attention to a few instances showing how the agriculture of to-day is benefited by the investigations of scientific workers. The chemist is now thoroughly recognized by the agricultural classes as the magician who can unlock to them hidden secrets as to the true value of various crops; can tell them which are the best to grow for stock, to provide food, or as fertilizers of the soil; can tell them, after analysis, what constituents of a soil are lacking, and advise them as to the most economical way of replacing the required elements. The skill of the practical botanist is now being chiefly directed to the examination of parasitic fungi, with the object of devising suitable remedies for those species which attack cultivated vegetation, or of propagating the parasitic forms which destroy insect life. In the closely allied branches of horticulture and agriculture, numberless experiments are being carried on daily with the object of discovering and originating by selection and hybridization new varieties of flowers, fruits, grains and vegetables; the best methods of propagation and cultivation, the best treatment of the soil and the most effectual and economical fertilizers. Here also, in passing, reference may be made to the care, improvement

and treatment in health and disease of all farm stock. All of the above work comes under the head of scientific agriculture—provided that it is done accurately—and is of incalculable value to the country at large. In no branch of natural science, however, I believe, have such important results been obtained, when gauged by their effect upon the revenue of the country, as in that branch of zoology which treats of insects and their depredations on the crops of the orchard, the garden, and the farm.

Historical.

Practical or economic entomology may still be described as a new study, and in no part of the world can it be said to have been developed with such marked good results as in North America, where the work was only begun in 1841 by the publication of Dr. T. W. Harris's classical report on the injurious insects of Massachusetts. This remarkable building up in America of a new and more important branch of an old science, has been mainly due to the great knowledge and special abilities of Prof. C. V. Riley, for many years United States Entomologist at Washington, and his very able successor, Mr. L. O. Howard. A history of the science of entomology would probably be of interest, but would be out of place here. A few landmarks, however, may be pointed out. There is an excellent concise history of the progress of entomology by Mr. S. J. Capper in his presidential address to the Lancashire and Cheshire Entomological Society, 1892. He says: "The most ancient references to Entomology are in the works of the great Aristotle, who was born in Greece, B.C. 384. Pliny the Elder, who died A.D. 79, wrote many treatises on Natural History in which references to bees and other insects occur. It was not till the 16th and 17th centuries that much attention was paid to the lives and habits of insects, when the '*Theatrum Insectorum*' of Thomas Muffet was published at London, A.D. 1634. This was the first work ever issued as a separate volume on all orders of insects, and was a most careful work, referring to everything that had ever appeared upon entomological matters up to that time. More advance took place in the 17th century, John Ray and Francis Willughby being important figures. But the popular value placed on the study of insects at that day may be shown from the fact that the will of Lady Glanville was disputed on the ground of insanity because she was known to collect and study insects. Moses Harris in his '*Aurelian*,' published in 1779, says 'The Fly *Melitæa Cinxia*, the Glanville Fritillary, took its name from the ingenious Lady Glanville whose memory had like to have suffered from her curiosity? Some relations that were disappointed by her will, attempted to set it aside by acts of lunacy, for they suggested that none but those who were deprived of their senses would go in pursuit of butterflies. Her relations and legatees subpœnaed Dr. Sloan, the founder of the British Museum,

and Mr. John Ray, to support her character. The latter went to Exeter and at the trial satisfied the judge and jury of the lady's laudable inquiry into the wonderful works of creation, and established her will."

In the 18th century the great Linnæus, 1707-1778, shines out as a bright luminary and may be drawn attention to here as the first economic entomologist, for his advancement and opportunities to do his magnificent zoological and botanical work were, it is said, largely due to his wisdom in recommending that the spars to be used as masts for the navy, which were lying in the royal dockyard at Stockholm, should be sunk in water to protect them from wood-boring insects. Réaumur, born in France in 1683, the inventor of the thermometer which bears his name, published between 1734 and 1742 his remarkable work "Mémoires pour servir à l'histoire naturelle des insectes," in which are detailed many original and accurate observations. He died in 1757.

Fabricius, 1745-1808, in Denmark, and Latreille, 1762-1833, in France, also did monumental work. In England, Curtis, the author of "Farm Insects," and Prof. Westwood, a most learned and voluminous writer, but best known by his "Modern Classification of Insects," were upholding the honour of their country.

In the article above referred to, Mr. Capper says: "In the beginning of the 19th century, Curtis's translation of 'Fundamenta Entomologiæ' published in 1772, Yeates's 'Institutions of Entomology,' which appeared the year after, and Barbut's 'Genera Insectorum,' 1781, were the only elementary works on entomology." Convinced that this fact was the chief obstacle to the spread of entomology in Britain, Messrs. Kirby and Spence resolved to do what they could to remedy the deficiency, and the publication in 1815 of the Introduction to the Study of Entomology did more to attract popular attention to entomology than any book before or since published. The chapters devoted to insects beneficial and injurious to mankind, with the best means then known for the encouragement of the one and the destruction of the other, were the first steps in the direction of economic entomology, the study of which has to-day become so important.

The Royal Agricultural Society of England was founded in 1840, and John Curtis, already well known as a writer on injurious insects, was invited to prepare each year a report on the injurious insects of crops. These reports ran from 1841 to 1857. They were afterwards consolidated and, with other matter added, formed his standard work on Farm Insects which appeared in 1860. By far the most important work which has been done in economic entomology in England, has been that of Miss Eleanor A. Ormerod, a public-spirited woman who much aided by her sister, Miss Georgina Ormerod, has given up the whole of her time to the collection of data and publishing at her own expense a series of illustrated reports, now seventeen in number, which are of inestimable value to the

farmers of Great Britain. Speaking of Miss Ormerod, in his annual address as president of the Association of Economic Entomologists, Mr. Howard says: "She has shown herself ingenious, careful and receptive to a degree, and at the same time possessed of an enthusiasm and an unlimited perseverance which are calculated to overcome all obstacles. She has studied many of the English crop enemies *de novo*, she has popularized the work of other English entomologists, and has made accessible to the agricultural class the work of John Curtis and Prof. Westwood, and has adopted and strongly advocated the adoption of measures found to be successful in other countries, particularly in America. The good which Miss Ormerod has accomplished, can hardly be estimated at the present time, but she will deserve, at the hands of posterity, canonization as the patron saint of economic entomology in England."

In addition to Miss Ormerod's work, a series of reports and bulletins has appeared from the pen of Mr. C. Whitehead, a practical farmer who also holds the position of technical adviser to the Board of Agriculture.

As stated above, great advance has been made on this continent, which is certainly due to the practical tendency of the majority of the people of North America to recognize what is useful when laid plainly before them; but also to the excellent nature of the work which has been done. It would be entirely out of the question to mention even the names of the many eminent economic entomologists of the United States, and only such will be cited now as are necessary in speaking of the few instances which I propose to lay before you, to illustrate a few of the heads of subjects embraced in a consideration of the practical use of the study of entomology.

In Canada, outside of the work done by the Dominion Entomologist's Department at Ottawa, founded in 1884, the development of economic entomology has been most intimately connected with that of the Entomological Society of Ontario, which issued its first report on injurious insects in 1870. Since that year these valuable reports have appeared regularly, and have supplied the farmers of Ontario with much information of incalculable value, which has certainly saved the country a great deal of unnecessary loss.

Special mention must be made of the classic work on "Insects Injurious to Fruits," by our fellow-member, Prof. W. Saunders. He and the Rev. Dr. Bethune, the present able editor of the "Canadian Entomologist," were both original members of the Entomological Society of Ontario, and have borne the brunt of the work of building up that thriving and useful organization which is now presided over by my esteemed colleague and co-worker, Mr. W. H. Harrington, who is now so well known in scientific circles all the world over for the care, accuracy and thoroughness of his work. The late Abbé Provancher published

much and did excellent work, but it was chiefly of a scientific and descriptive nature.

In the curriculum of the Ontario Agricultural College at Guelph, practical entomology is included, and Prof. J. H. Panton not only lectures on this subject to the students, but has also published several timely bulletins on injurious insects for the use of farmers. Besides the above, there have appeared some useful articles by Prof. A. H. Mackay in the "Educational Monthly" of St. John, N.B., and an excellent article on the Flour Moth by Dr. Bryce of Toronto. Useful notes on the occurrence of injurious insects have also appeared in the report of the statistician of the Department of Agriculture of British Columbia. In 1894 an Inspector of Fruit-pests was appointed for British Columbia in the person of Mr. R. M. Palmer, and doubtless good results will follow this step.

A fact which should never be lost sight of, in considering the progress and bearings of practical entomology in Canada, is the enormous advantages we enjoy from having so near to us the United States, with its army of trained entomologists and other officials at Washington and at the state colleges and agricultural experiment stations. Most of the insect enemies which are injurious in Canada occur also in some of the States of the Union, and it is mutually advantageous to entomologists here and in the United States to be able to study together, under slightly different circumstances, any new pests which may occur. In addition to this, of course, many of the insects which appear in Canada have already been studied out carefully in the United States before they reach our borders, and we have the benefit of all the experience of our neighbours to guide and help us in counteracting their attacks. In the case of some insects practical and effective remedies have been discovered before the insects invaded our borders. Notable instances of such insects are found in the Cattle Horn-fly, the Pear-leaf Blister-mite, and the Pear-tree Psylla.

General Principles.

It does not require much observation to see that the annual losses due to insects are very great, and no good object would be served by attempting here to give in figures the estimated amount of such losses; but it may certainly be stated that at least one-tenth of all crops grown is annually destroyed by insects. Further than this, the life-histories of many of the species causing this loss have been so carefully worked out that there is no doubt that a large proportion of that percentage may be saved by practising some of the simple, cheap and effective remedies which have been recommended by entomologists. I hope it may not seem too redundant if I briefly draw your attention to some of the general principles, which probably to most of you are well known, by which the

attacks of injurious insects are met. All remedies are devised with regard to the nature or habits of the insects to be controlled. Insects can be divided into two large classes by the nature of their mouth parts: (1) Mandibulata, or Biting insects, and (2) Haustellata, or Sucking insects. The first of these can be destroyed by placing active poisons on their food-plants, so diluted as to be innoxious to the plant, but at the same time sufficiently powerful to destroy the insects. For the second class, insecticides which kill by mere contact with their bodies, are necessary. We have now standard active remedies which answer for both of these classes, and, in addition, many preventive measures may be taken by which injury is warded off. All these methods, together with the necessary apparatus, have been treated of with considerable detail in Bulletin 11 of the Central Experimental Farm series, copies of which are still available for all who apply for them; and I now propose, under a few heads, to speak as briefly as possible of some instances of good entomological work which demonstrate the practical value of a knowledge of economic entomology.

Controlling by Remedies.

Reverting now to the two classes of injurious insects—Biting insects and Sucking insects,—I will draw your attention to the value of the two standard remedies for these classes: 1. Paris green, which is an arsenite of copper containing about sixty per cent of arsenic, is almost an ideal material for the purposes to which it is applied by entomologists. Its characteristic green colour advertizes its poisonous nature, and prevents many accidents which might arise from carelessness; its insolubility in water and under most conditions to which it is likely to be exposed before it is applied, renders its use very simple. Its fine state of division makes its dilution, either with liquids or dry powders, very convenient. Moreover, its extreme virulence as a poison makes it possible to dilute it very much indeed without destroying its efficacy as an insecticide. The recent discovery that the admixture of an equal weight of fresh lime with the arsenite neutralizes its caustic effect upon vegetation, has removed the last drawback to the use of this material. This has also simplified immensely the question of the most suitable remedy for Mandibulate insects. Now, a standard strength of one pound of Paris green, one pound of quick-lime and two hundred gallons of water, may be recommended for use on all kinds of vegetation. Three years ago I had the honour of laying before this section some of the remarkably satisfactory results which had been obtained by spraying fruit-trees with Paris green to protect them against insect injury. Since that time I have lost no opportunity to bring this matter officially before the farmers of Canada, and to-day there is more spraying being done throughout the

country than has ever been previously the case over an equal area of territory, and during the present spring there is certainly an enormous increase in the number of fruit-growers and farmers who are adopting this useful method of protecting their crops from injury. This is to a large measure due to an excellent series of experiments carried on by my colleague, Mr. John Craig, Horticulturist of the Central Experimental Farm, in the fruit orchards of western Ontario last year. I have no doubt at all that the fruit-growers of Canada will reap a rich harvest for their pains, which will much more than repay them for the extra outlay and labour. The question of the combination of fungicides and insecticides, first prominently brought forward by Prof. Clarence M. Weed of New Hampshire, is now known to be an important one, and many of the agricultural experiment stations have issued spraying calendars in which this dual treatment is universally recommended.

2. Kerosene emulsion, the standard remedy for Sucking insects, is simply an emulsion made by churning for five minutes two gallons of coal oil with one gallon of hot soap-suds containing half a pound of soap. This gives the stock emulsion, which may be reduced with water to any degree of weakness, and which may be used on most foliage with impunity, if mixed with nine times its volume of water. Moreover, it is a most effective destroyer of all insects upon which it may be sprayed. It is particularly effective against scale insects, a class of insects which are very difficult to treat. In the effort to eradicate the pernicious San José scale, recently detected in the eastern States, this was found to be a useful remedy. The occurrence of that scale east of California, and the vigorous, prompt measures adopted by the United States Entomologist, have obtained for that officer great credit among the fruit-growers of America.

Another of Mr. Howard's triumphs was the working out of the full life-history of the Cattle Horn-fly, a pest of horned stock, which of recent years has been the cause of much loss to dairymen. I happened to be in Washington at the time its first occurrence was announced in Virginia, and had the opportunity of going with Mr. Howard to the infested district, where he collected the first eggs of the fly, from which he successfully worked out the complete life-history, and proved that the maggots bred entirely and only in fresh cattle droppings. This indicated at once two remedies: one preventive, for protecting the cattle from the bites of the flies, for which kerosene emulsion, with a little carbolic acid added, is one of the best; and the treatment of the droppings so as to render them unfit breeding-places for the maggots.

Controlling by Natural Enemies.

One of the most remarkable instances of widespread benefit to a large district from the carefully thought-out plans of a competent entomologist is the celebrated case of the introduction into California by

Prof. Riley of the small Australian Lady-bird beetle (*Vedalia cardinalis*), with the object of destroying an injurious scale insect, which was working great havoc in the California orange-groves. The Fluted Scale, otherwise known as the "White" or "Cottony-cushion Scale" (*Icerya purchasi*, Maskell), is, for its family, a large species, which was probably introduced into southern California about 1868, and, having reached the groves of citrus fruits, spread rapidly and increased so enormously that at the end of twenty years it not only had attracted universal notice by the extent of its injuries, but was the cause of great alarm. All efforts to control this insect seemed ineffectual, owing chiefly to its power both of living on a great variety of food-plants and of surviving for long periods without any food at all. Prof. Riley in 1886 directed his attention especially to the subject of discovering a practical remedy for this insect, and, having convinced himself that it was indigenous to Australia, and having also observed that it only occurred there in moderate numbers, he concluded that there must be in its original home some natural parasite which was keeping it in check there and preventing it from multiplying to the injurious extent to which it was occurring in California. A recognized rule in practical entomology is that when a foreign insect is introduced into a new home and increases excessively, this is due not only to the suitable conditions it finds in its new home, but particularly to the fact that its own special parasites are not as a rule imported with it. It is true that frequently the parasites of allied species of insects gradually acquire the habit of depredating upon the newcomer, but this takes some years, and may be only partially effective or not take place at all. It was noticed that some of the native predaceous Californian insects were attacking the Fluted Scale to some extent, but Prof. Riley urged that greater success would be secured by importing from Australia its own natural enemies. After much trouble, this plan was satisfactorily carried out, through the skill of Mr. Albert Koebele, who was sent to Australia by Prof. Riley in 1888, and succeeded in sending home safely to California several consignments of parasitic and predaceous enemies of the Fluted Scale. One of these, known as *Vedalia cardinalis*, a small Lady-bird beetle, has more than answered all the expectations of its introducers; for, in the short space of one year and a-half from its first introduction, it has practically cleared out the injurious Fluted Scale throughout the infested region. It increases with surprising rapidity, taking only a month from the time the eggs are laid until the perfect beetles appear. The females lay a large number of eggs, and, as far as is known, it feeds exclusively on the Fluted Scale. Prof. Riley, in relating the history of this experiment, says: "The expression of two well-known people may be quoted here to illustrate the general verdict. Prof. W. A. Henry, director of the Wisconsin Agricultural Experiment Station, who visited California in 1889, reported that the work of *Vedalia*

was the finest illustration possible of the value of the department to give the people aid in time of distress, and the distress was very great indeed." Mr. William F. Channing, of Passadena, wrote, two years later: "We owe to the Agricultural Department the rescue of our orange culture by the introduction of the Australian Lady-bird, *Vedalia cardinalis*. The White Scales were incrusting our orange-trees with a hideous leprosy. They spread with wonderful rapidity, and would have made citrus growth on the whole North American continent impossible within a few years. It took the *Vedalia*, when introduced, only a few weeks absolutely to clean out the White Scale. The deliverance was more like a miracle than anything I have ever seen. In the spring of 1889 I had abandoned my young Washington Navel orange-trees as irrecoverable. Those same trees bore from two to three boxes of oranges apiece at the end of the season (or winter and spring of 1890). The consequence of the deliverance is that many hundreds of thousands of orange-trees of the finest varieties have been set out in southern California this last spring."

In other words, the victory over the scale was complete and will practically remain so. The history of the introduction of this pest, its spread for upwards of twenty years and the discouragement which resulted, the numerous experiments which were made to overcome the insect and its final reduction to unimportant numbers by means of an apparently insignificant little beetle imported for the purpose from Australia, will always remain one of the most interesting stories in the records of practical entomology." The results of all this may be summarized as follows:—An experiment, the cost of which was limited to $2,000, has rendered the cultivation of oranges, lemons, limes and other citrus fruits possible in California, whereas but for this experiment the whole of that important and lucrative industry would inevitably have been entirely wiped out, thus involving the loss of hundreds of thousands of dollars. The same satisfactory results have also followed the introduction of the *Vedalia* into Cape Colony and Egypt.

Controlling by Vegetable Parasites.

Closely allied with the subject of the utilization of the insect parasites of insects is the propagation and distribution, when required, of the contagious diseases of insects of a bacterial or fungous nature. In this direction careful investigations and extensive experiments have been carried on in Kansas by Prof. Snow, in Illinois by Prof. Forbes, and in Massachusetts by Prof. Roland Thaxter.

Prof. Forbes has recorded ('Insect Life,' V., p. 68) that several of the plant parasites of insect feed greedily on very common substances, and may consequently be kept in stock or made to multiply on occasion with enormous rapidity, and so scattered broadcast where and when most

needed. This is true of all the bacterial germs of insect disease thus far studied, and also of certain higher fungi infesting insects.

Extensive work has been done in France by Monsieur Alfred Giard on a species which he calls *Isaria densa* (*Botrytis tenella* of Prillieux and Delacroix), a fungus particularly destructive to species of White-grubs (*Lachnosterna*), and tubes containing the spores have been extensively advertised in Europe. In this country the fungus most extensively used in this work is known as *Sporotrichum globuliferum.* This has been carefully cultivated and much used as a means of checking the enormous hordes of the injurious chinch-bug which yearly do so much harm in the western States. A long and interesting account of Prof. Snow's work in this connection will be found in the Annual Report of the Entomological Society of Ontario for 1892. Prof. Forbes described the parasite as follows:—"This fungus, which springs from minute white spores or so-called *conidia*, penetrates the living insect and finally imbeds the dead body of its host in a thick felt of white fibres which becomes covered with myriads of white or slightly yellowish spores collected in globular heads. It does not form resting spores, belonging in fact to an order of fungi in which such spores have never been found, but it may nevertheless be preserved in a living state for many months—certainly over the winter—by simply drying out the ripe conidia. We have so preserved it in fact for an entire year, and have found by experiment that the vitality of its conidia is proof against at least ordinary winter temperatures and summer heat of 104 degrees F." "The fungus may be cultivated in large quantities very readily in disinfected fruit jars on corn meal soaked with beef broth, the growth forming a thick layer of dust-like spores on the surface, which may be brushed or scraped off and preserved for use in homeopathic vials plugged with cotton. This parasite is by no means uncommon in Canada and occurs upon several insects. The most remarkable epidemic of it which has come under my notice was in 1891 in Vancouver Island. For some years previous to 1891 the oaks on Vancouver Island had been annually defoliated in the spring by myriads of caterpillars of a moth known as *Ellopia somniaria.* In 1891 many diseased caterpillars were sent to me by Mr. W. H. Danby, of Victoria, and were found on examination to be infested with this fungus. The following year and up to the present time, the caterpillars have been so scarce that a single specimen can only be found with difficulty. It is true there were parasitic insects also at work; but I consider that the chief cause of diminution of the caterpillars was due to this disease.

Other fungi of interest which frequently do good work are the peculiar parasite of the White grub (*Cordyceps melolonthæ*) and an Empusa (*E. aphidis*), frequently abundant and destructive not only to myriads of the injurious plant-lice, but also to numerous other insects.

Agricultural Treatment.

A most necessary part of good agriculture which affects entomology, and which therefore an entomologist must study, is a comprehension of the principles regulating the rotation of crops, by means of which any insect attracted to a locality by a certain food-plant being grown there, will not have the same food-plant to feed upon the next year. It sometimes becomes necessary to change the time of planting or reaping crops, so as to present it to its insect enemies, at their regular time of appearing, in a condition in which it cannot be injured, or even to give up the cultivation of a crop for a length of time altogether, so as to starve the insects out. For the effective application of this latter remedy great care must be taken to have all hedges, waste lands and fence corners kept clean from weeds. Occasionally, the planting of a small strip of a more attractive food-plant round the outside of a field has had the effect of drawing off insects from the main crop. It is a common practice with some gardeners to plant a few radishes amongst their seedling cauliflowers in order to concentrate the attacks of root maggots; and in the same way mustard is planted with turnips in order to attract the flea-beetles: as mustard germinates sooner than turnips, the beetles are attracted to it, and then destroyed by dusting the plants with Paris green. Lately Prof. Howard E. Weed has practised this bait-trap method with mustard in order to collect the exceedingly injurious Harlequin plant-bug, which destroys cabbages in Mississippi and other southern States. When the strip of mustard has attracted the bugs, it is sprayed heavily with a strong kerosene emulsion.

As an instance of keen perception and useful grasp of a subject in this line, I will draw your attention to the remedy first suggested by Mr. L. O. Howard for the Clover-seed Midge, which every year so materially lessens the output of an important crop in Canada. In my report for 1885 to the Honourable Minister of Agriculture, I stated as follows: "Ontario in 1881 produced a crop of clover-seed worth $648,600. Since that time the Clover-seed Midge has made its appearance, and its injuries have been so considerable that, instead of Canada exporting large quantities of this valuable seed, our farmers have now to import seed to sow their fields." I used every effort to make known widely the following treatment, which was adopted in many districts with most satisfactory results, and gradually the production of Canadian clover-seed has increasd year by year.

Instead of cutting the first crop of clover at the end of June and leaving the second crop for seed in the fall, pasture the first crop until the middle or up to the 20th June, or cut it before the latter date, and then let the clover grow for the fall crop of seed; thus the grubs of this first brood (the eggs of which were deposited on the growing clover as

soon as the heads formed) are destroyed by the cattle eating them, or they dry up with the clover hay which has been cut before they were mature enough to leave the heads of clover and go into the ground to complete their stages. By leaving the clover standing in the fields till the end of June a sufficient time elapses for this latter process to take place, and the perfect flies emerge again just in time to lay their eggs in the opening flowers of the second crop. In this way, the seed of the second crop is destroyed as well as the first. The discovery of this practical remedy I formerly attributed to a Canadian farmer; but I find it, together with many other suggestions of great value in economic entomology, was undoubtedly first suggested by Mr. Howard.

Systematic Co-operation.

Finally, let me bring before your notice one instance exemplifying how combined systematic effort may work wonders even in an apparently hopeless case.

Of the many injurious insects introduced at various times from the old world, not one has, in as short a time, attracted so much attention, been so great a cause of anxiety, or has been so systematically fought as the Gypsy Moth, since it appeared in vast numbers in the state of Massachusetts in 1889. As a practical object lesson of the value of scientifically directed effort to overcome an insect enemy which had been allowed to increase unnoticed until it had assumed almost overwhelming proportions, the campaign which has been so successfully carried on for the last four years by the Gypsy Moth Department of the State Board of Agriculture of Massachusetts, is of very great interest to all economic entomologists.

Mr. L. O. Howard, the United States Entomologist, one of the best qualified to express an opinion, says, in his recent address as president of the Association of Economic Entomologists, as follows: "The work upon the Gypsy Moth which has been done by the State of Massachusetts since 1889, is one of the most remarkable pieces of work, judging by results, which has yet been done in economic entomology. The operations have been carried on by a committee of the State Board of Agriculture, and the means have been furnished by large appropriations by the State Legislature. Three hundred and twenty-five thousand dollars have already been appropriated. A territory comprising something over 100 square miles was infested by the insects, which occurred in such extraordinary numbers as to destroy many trees, and almost to threaten the ultimate extinction of living vegetation, not only within the infested territory, but in all localities to which it might spread. The infested territory has been reduced by one-half, and within the districts in which the Gypsy moth at present exists, it is, practically speaking, a comparatively rare species. The future of the insect is, however, problematical.

The continuance of sufficiently large appropriations from the State Legislature to enable the work to be carried on, on its present scale, is doubtful, and yet those in charge believe that still larger appropriations are necessary to bring about extermination. They are confident, however, that with sufficient means, the insect can be absolutely exterminated from the State of Massachusetts."

The few instances which I have given, will, I believe, show the great economic value of the study of entomology, and, as I have already taken up as much of your valuable time as is permissible on this occasion, I will not cite any more of the numberless cases which might be brought forward ; but, in conclusion, let me state that, notwithstanding the enormous numbers of insects in the world, those particular kinds which generally every year attack farm crops, are comparatively few in number—not more than one hundred species.

The life-histories of most of these have been so well worked out that I think it is not too much to claim that, upon application to a competent entomologist, information is now available with regard to most of them, which will enable those inquiring for it, to lessen, mitigate or avert altogether the injury from injurious insects.

II.—*Preliminary Catalogue of the Marine Mollusca of the Pacific Coast of Canada, with notes upon their distribution.*

By the REVEREND GEORGE W. TAYLOR, F.Z.S.

(Read May 25, 1894.)

In the present paper I have not attempted anything more than is expressed in the title, namely a "Preliminary Catalogue" of the Marine Mollusca of our province.

The time when it will be possible to write an exhaustive history of our western shells has not yet come. Too little local collecting has been done. We who are resident within the province, and who have opportunity of examining the shells themselves, are unable to consult much of the necessary literature. On the other hand, naturalists more favourably situated with regard to books, and who have access to the great libraries, lack the advantage of possession of complete series of specimens.

Some day, let us hope, scientific literature will be more accessible to us in the far west and then perhaps we may be able to study our fauna thoroughly on the spot. In the meantime it is believed that a catalogue like the present, in which are brought together the results of the observations of the principal previous workers, will be of use to those who may, in the future, be led to take up the subject.

It is not claimed, of course, that even as a compilation this catalogue is free from error, but every care has been taken in verifying quotations and records, and it is hoped that no very serious blunders will have crept in.

A writer upon west American mollusca must almost of necessity take as his starting point the classic works of Dr. P. P. Carpenter.

When that distinguished conchologist presented his first report [1] to the British Association, hardly anything was known of the mollusca of the Vancouver province. Only about 85 species belonging to our fauna were noted as west American in that report, and nearly all of these were either Arctic or Southern Californian shells.

In the interval, however, between 1856 and the completion, in 1863, of Dr. Carpenter's second report [2] a vast amount of additional information was accumulated.

[1] "Report on the present state of our knowledge with regard to the mollusca of the west coast of North America," in the Report of the British Association for 1856, published in 1857.

[2] "Supplementary report on the present state of our knowledge with regard to the mollusca of the west coast of North America," in the Report of the British Association for 1863, published in August, 1864.

The naturalists attached to the British and United States Boundary Commissions made large collections of marine shells in Puget Sound and on the shores of Vancouver Island.

Fourteen species, supposed to be new to science, were obtained by Mr. J K. Lord, of the British expedition, and were described in the Proceedings of the Zoological Society of London (for 1863) by Dr. W. Baird, who at the same time, and in the same publication, described two other species *Leda fossa* and *Nucula Lyalli* which had been dredged in Esquimalt Harbour by Dr. Lyall, of H. M. S. Plumper.

The shells collected by Dr. Kennerley, naturalist to the American Commission, were not described until two years later, the delay being in great part due to the death of Dr. Kennerley almost immediately after his return from the expedition. Dr. Kennerley's shells were collected principally in Puget Sound, and are catalogued, and the new species indicated by Dr. Carpenter in his second report. The new species, some 25 in number, were fully described in the Proceedings of the Academy of Natural Sciences (Philadelphia) for 1865. More than seventy species were added to the Vancouver fauna from this collection.

A third very important collection from our waters, examined by Dr. Carpenter and fully reported on by him in the "Supplementary Report" above referred to, was made by Mr. (now judge) J. G. Swan with the help of Indians at Neeah Bay, and other points on Puget Sound, and the neighbouring British Columbian coasts. From this collection about 50 species not noticed by either Lord or Kennerley were added to our list, about 20 of these being new to science.

The species contained in these three collections are arranged in systematic order in columns 5, 6 and 7 of the table of species appearing on pages 636 to 664 of Carpenter's 1863 report, and form the "Vancouver" list of thirty years ago.

The number of species named in this list is as follows :

In column 6. Lord's collection, number of names	79	
Deduct varieties, etc	3	
		76
In column 5. Kennerley's collection, additional names	81	
Deduct varieties, synonyms, etc	8	
		73
In column 7. Swan's collection, additions	71	
Less varieties and synonyms	20	
		51
Total		200

Dr. Carpenter also quotes from Vancouver Island on other authority the following species: *Glycimeris generosa*, *Chrysodomus liratus* and *Ischnochiton interstinctus*, thus raising the total to 203.

Many of these species were only known, in Carpenter's time, from Puget Sound (that is to say *United States*) localities, but as nearly all of them have already been found to occur in British Columbian waters also, we take it for granted that the others will all eventually be found within our limits.

In the present paper 284 marine species are noted as follows:

	In Carpenter's List	Since Added	Total.
Brachiopoda	4	1	5
Pelecypoda	79	31	110
Scaphopoda	2	1	3
Gasteropoda—			
Pteropoda	1	0	1
Opisthobranchiata	3	4	7
Nudibranchiata	0	0	0
Pulmonata	1	0	1
Ctenobranchiata	94	39	133
Polyplacophora	17	4	21
Cephalopoda	2	1	3
	203	81	284

If we add our 67 land and fresh water species we have a total of 351 as being the number of British Columbian mollusca at present known.

Of the 81 additions to the list since 1864, more than one-half will be found recorded in the four papers, by Mr. J. F. Whiteaves, which must now be considered.

The first of these is an account of a collection made by Mr. J. Richardson of the Geological Survey of Canada on the east coast of Vancouver Island in 1874-75. It is entitled "On some Marine Invertebrata from the west coast of North America" and it was published in the 'Canadian Naturalist,' vol. viii., N. S. No. 8, December, 1878.

Eleven species are herein added to our list, one of them "*Cardium Richardsoni*" being described as new to science. This shell has, however, turned out to be equivalent to Carpenter's *C. centifilosum*. The other additions are:

Megerlia Jeffreysi, Modiolaria nigra, Serripes Laperousii, Kennerlia grandis, Pholadidea ovoidea, Surcula perversa, Buccinum polare, Trophon tenuisculptus, Trophon muriciformis (= Dallii) and "*Margarita Vahlii.*" This last shell, which I have seen in the Geological Museum, Ottawa, is a specimen of the *Solariella varicosa* of Mighels and Adams, but though wrongly identified by Mr. Whiteaves, is none the less an addition to our list.

Mr. Whiteaves's second paper is a more elaborate one. It is "On some Marine Invertebrata from the Queen Charlotte Islands" and forms an appendix (C) to the report of Dr. G. M. Dawson on his explorations

in the Queen Charlotte Islands in 1878. The paper is published in the Report of Progress of the Geological Survey of Canada for 1878-79.

Dr. Dawson took home quite a large collection of shells of about 135 species, no fewer than 22 being additions to the list, and 2 of these new to science.

The new species are :—*Macoma carlottensis* and *Lepton rude*, and the other additions are :—*Bryophila setosa*, *Crenella decussata*, *Leda cælata* (= acuta) *Astarte undata*, *Cryptodon flexuosus*, *Lucina filosa* (= acutilineata) *Macoma sabulosa* (= lata) *Bela Trevelyana*, *Mitromorpha filosa*, *Mangilia sculpturata*, *Volutella pyriformis*, *Chrysodomus Harfordi*, *Odostomia Sitkensis*, *Odostomia straminea*, *Cœcum crebricinctum*, *Lamellaria Stearnsii*, "*Fenella*" *pupoidea*, "*Fissurella*" *bimaculata*, *Tonicella marmorea* and *Chætopleura Hartwegii*.

Some of the shells noted in this paper seem to have been incorrectly determined. A few corrections have been made by Mr. Whiteaves himself in subsequent papers as follows :—

Moera variegata,	should be	*M. salmonea*.
Astarte semisulcata,	"	*A. undata*.
Leda cælata,	"	*L. acuta*.
Chlorostoma brunneum,	"	*P. pulligo*.
Galerus contortus,	"	*G. fastigiatus*.

The following additional corrections, to which I think Mr. Whiteaves will assent, are also needed :

Turtonia minuta.—The shell, in the Ottawa Museum, is a large specimen of *Tellimya tumida*.

Cylichna alba.—This is *C. attonsa*.

Amphissa versicolor.—Merely a small form of *A. corrugata*.

A third paper by the same author was published in the Transactions of this Society (vol. iii., section iv., 1886). It is an account of the Invertebrata obtained by Dr. Dawson, principally by dredging, off the northern and northwestern coasts of Vancouver Island in 1885.

One hundred and forty-seven species of mollusca are noted, fourteen being new to the fauna and two, so it was thought at the time, new to science.

The supposed new species are : *Cadulus aberrans* which still stands, and *Leptochiton punctatus* the type of which appears to be a very pale form of *Ischnochiton retiporosus*.

The other additions to the list are : *Pecten Vancouverensis* (recorded as "Alaskensis"), *Limatula subauriculata*, *Yoldia thraciæformis*, *Bela violacea*, *Cancellaria circumcincta*, *Admete viridula* (= Couthouyi) *Sipho* (misprinted *Siphon*) *Verkruzeni*, *Trophon Stuarti* (recorded as *orpheus*)

Eulima incurva, *Barleeia haliotiphila* (recorded as *subtenuis*) *Solariella peramabilis*, *Lepidopleurus cancellatus* and *Ommastrephes sagittatus*.

A few corrections may be made :

Pecten Alaskensis.—This specimen is the type of *P. Vancouverensis* since described by Mr. Whiteaves as a new species.

Cylichna alba.—Is again recorded, but the specimens, which I have seen, are undoubtedly *C. attonsa* of Gould.

Leptochiton punctatus.—A pale specimen of *Ischnochiton retiporosus*.

Barleeia subtenuis.—These are *B. haliotiphila*. *B. subtenuis* is southern and a much larger shell.

Trophon orpheus.—These are fine specimens of *Trophon Stuarti*, a perfectly distinct species which has been placed in the synonymy of *T. orpheus* by several conchologists who have probably not had the opportunity of examining many specimens.

In Mr. Whiteaves's fourth paper[1] he describes and figures *Pecten Vancouverensis* n.sp., and puts on record two additions to our list,—*Cumingia Californica*, a southern shell, and *Emarginula crassa*, a rather remarkable discovery, as there is not, I believe, any other record of the occurrence of the species in the Pacific Ocean.

It will be seen that in these four important contributions to our knowledge no fewer than forty-nine species are added to Carpenter's list.

The efforts of other collectors during the past few years have resulted in a further addition of 32 names, and there is little doubt but that there are still many more species inhabiting our waters to be one day discovered by the enthusiastic conchologist.

The local collections to which I shall refer in the present paper have been made by Dr. C. F. Newcombe, Professor Macoun and myself. Dr. Newcombe has collected diligently and successfully in the neighbourhood of Victoria ; at Comox, 140 miles north of Victoria ; at Clayoquot Sound on the west coast of Vancouver Island ; and in some other localities. The results of his work appear in a "Report on the Marine Shells of British Columbia," which was published in February last in the 'Bulletin of the Natural History Society of British Columbia.' This report contains a large amount of information on the distribution of our mollusca and has indeed almost rendered the present paper unnecessary.

Professor Macoun collected last year (1893) at Comox, Nanaimo and Sooke with much success. In July last, I had the pleasure of joining the professor in a day's dredging in Departure Bay. Using a home-made dredge from an ordinary sailing boat manned by three

[1] "Notes on some Marine Invertebrata from the coast of British Columbia," Ottawa Naturalist, vol. vii., no. 9, p. 133 (December, 1893).

men, we secured more than 7,000 specimens of 88 species of mollusca, including one species, *Rictaxis punctocælata*, that I had not before observed in this province.

I had myself collected on a previous occasion in the same locality; and during a number of years I have dredged and made shore collections near Victoria; and at Vesuvius Bay and Ganges Harbour, on Salt Spring Island; and at Comox. I have not so far had any opportunity of personally visiting more northern or west coast localities.

In the notes that follow, I have endeavoured to give under each species, a reference to the original description and figure; secondly, such synonyms as appear necessary to connect this list with previous papers on the same subject, likely to be consulted by the student; thirdly, a list of the localities, within the province, in which the shell has been found; and lastly, some brief notes as to its station, relative abundance, and so forth.

The determination of the shells themselves may be accepted, I think, as fairly accurate. I have had opportunities of studying the large collections in the Museum of the Geological Survey in Ottawa, and also the Vancouver shells in the Natural History Museum at South Kensington. Moreover, most of the difficult species have been submitted at different times to Dr. Dall, who has most kindly helped me, during several years past, in identifying puzzling specimens.

In the arrangement of the species I have endeavoured to follow, as nearly as I could, the classification adopted by Dr. Dall in his most useful catalogue of the shells of the Atlantic coast of the United States, published in 1889, as Bulletin 37 of the U. S. National Museum.

No attempt has been made to give a complete bibliography of the subject, but the titles of a number of the most useful papers are given in full in the following notes. Other useful papers, to which it is not possible to refer at length here, have been contributed by Drs. Cooper, Dall, Stearns and Pilsbry to the American Journal of Conchology and the Proceedings of the Academy of Natural Sciences (Philadelphia) the California Academy of Sciences and the United States National Museum.

CATALOGUE OF SPECIES, WITH NOTES.

BRACHIOPODA.

The recent *Brachiopoda*, and especially the American species, have been well worked up by Dr. Dall. To his numerous papers on the subject in the American Journal of Conchology (vols. vi. and vii.) and in the Proceedings of the Academy of Natural Sciences of Philadelphia, the student is referred for extended notices of our British Columbian forms.[1]

TEREBRATULINA, D'Orbigny.

1. TEREBRATULINA UNGUICULA, Carpenter, sp.

Terebratula unguicula, Cpr., Rept. Brit. Assoc., 1863, p. 636 (Aug., 1864); and Proc. Zool. Soc. London, 1865, p. 201, fig. 1-4.

This species is now generally considered to be only a variety of *T. caput-serpentis*, Linne, sp. (*Anomia caput-serpentis*, Linn., Syst. Nat., ed. xii., vol. i., pt. 2, p. 1153, no. 236, 1767) which is, of course, the older name. Our species or variety was first described as from "San Diego 6 fms., Monterey, not rare in 20 fms. Cooper, Neeah Bay (valve) Swan, Vancouver, Forbes." It is not rare at Victoria and Departure Bay and has been dredged by Dr. Dawson in the Straits of Georgia, Discovery Passage, Johnston Strait and Forward Bay. Probably it will be found to occur throughout the province. Generally specimens are found attached to stones or dead shells dredged in from 1 to 100 fathoms, but on one occasion I obtained a fine series attached to the hairy epidermis of a living specimen of *Tritonium Oregonense*. Dr. Dall states that specimens from deep water are generally larger than those from near low water mark.

TEREBRATELLA, D'Orbigny.

2. TEREBRATELLA TRANSVERSA, Sowerby, sp.

Terebratula transversa, Sby., Proc. Zool. Soc. London, 1846, p. 94; and Thes. Conch., vol. I., p. 261, pl. 72, fig. 114-115 (1846) = *Terebratula caurina*, Gould, Proc. Bost. Soc. Nat. Hist., vol. iii., p. 347 (December, 1850); and U. S. Expl. Exped., p. 468. figs. 582-582c (1852).

This is an extremely common shell with us. It occurs in two distinct forms—a smooth deep-water form, which is the typical *transversa*, and a highly sculptured form occurring in thousands between tides, and

[1] Descriptions of all our species are contained in Dall's "Report on the Brachiopoda of Alaska and the adjacent shores of Northwest America." Proc. Acad. Sci. Phil., 1877, p. 155 et seq.

to which Gould's name, *caurina*, more strictly applies. The shore variety sometimes attains a very large size, one mentioned by Dall measuring 58 × 50 × 31 mm. I have specimens from Salt Spring Island and Departure Bay nearly as large.

LAQUEUS, Dall.

3. Laqueus Californicus, Koch, sp.

Terebratula Californica, Koch, Kuster's Martini, vol. viii., pl. xxvi., figs. 21-23.

This is not a common shell in any locality. Dall quotes its range as from Port Etches to Catalina Island, California, and remarks that it is everywhere rare, owing to its deep-water habitat. It is sometimes, however, found in comparatively shallow water, as at Victoria, where Mr. Richardson, Dr. Newcombe and myself have all dredged it. It has also been taken within the province by Dr. Dawson, in Discovery Passage and Johnston Strait and at the Queen Charlotte Islands.

British Columbian specimens are said to be smaller than Californian ones, and have received from Dr. Davidson, in his latest work,[1] the varietal name of *Vancouverensis*.

MEGERLIA, King.

4. Megerlia Jeffreysi, Dall.

Ismenia (?) *Jeffreysi*, Dall, Amer. Journ. Conch., vol. vii., p. 65, pl. xi., fig. 7-10 (March, 1871).

The only specimen that I have heard of as having been taken in British Columbia is the single dead shell obtained by Mr. J. Richardson at Victoria in 1875.

HEMITHYRIS, D'Orbigny.

5. Hemithyris psittacea, Gmelin, sp.

Anomia psittacea, Gmelin, Syst. Nat., ed. xiii., vol. i., pt. vi., p. 3348 (1788).

This is a common and well-known circumpolar shell, which on the west American coasts seems to reach its southern limit at the Straits of Fuca.

Though not so abundant in British Columbia as *T. transversa* or *T. unguicula*, it has been met with at Victoria by Mr. Richardson, Dr. Newcombe and myself, and at Discovery Passage and Johnston Strait by Dr. Dawson.

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[1] "Monograph of Recent Brachiopoda," Trans. Linn. Soc. London, vol. iv., 1886-87.

PELECYPODA.

OSTREA, Linne.

6. Ostrea lurida, Cpr.

Suppl. Rept. Brit. Assoc., 1863, p. 645 (Aug., 1864); and Journ. de Conch., vol. xii., p. 137 (April, 1865).

Common on all the coasts of British Columbia, northward to Queen Charlotte Sound. Dr. Dawson found specimens at Malaspina Inlet and also (abundantly) at Bradley Lagoon, Blunden Harbour, Queen Charlotte Sound, on the mainland side. This last locality is said by Mr. Whiteaves (Trans. Roy. Soc. Can. iv., iv., 118) to be the most northerly locality on record for the species in British Columbia.

7. Ostrea Virginica, Gmelin.

Syst. Nat., ed. xiii., vol. i., p. 3336, no. 113 (1788).

This species was introduced into the "Victoria Arm" some years ago, and has become to a certain extent naturalized. Prof. Macoun last summer (1893) found a finely grown adult specimen some little distance from the mouth of the Colquitz River, which flows into the Victoria Arm.

PLACUNANOMIA, Broderip.

8. Placunanomia macroschisma, Deshayes, sp.

Anomia macroschisma, Desh., Rev. Zool. Soc. Cuv., p. 359 (Dec., 1839); Mag. de Zool. (Guerin's) 1841, pl. xxxiv.

Very common everywhere between tides, and found also, but less frequently, in deeper water.

My finest specimens are from the rocks at Vesuvius Bay, Salt Spring Island. Very curious forms occur in the burrows of *Penitella*.

PECTEN, Müller.

9. Pecten caurinus, Gould.

Proc. Bost. Soc. Nat. Hist., vol. iii., p. 345 (Dec., 1850); and U. S. Expl. Exped., Mollusca, p. 458, fig. 569-569b (1852).

Not very common. This species was not found by Dr. Dawson either at the Queen Charlotte Islands or at the north of Vancouver Island.

The specimens I have seen have nearly all been from the neighbourhood of Comox, where Richardson dredged it in 1874, and where Dr. Newcombe has since taken it.

I have myself dredged this species living, but only on one occasion, near Victoria.

10. Pecten hastatus, Sby.

Thes. Conch., vol. i., p. 72, pl. xx., fig. 236, = *hericius*, Gould.

Common, and in some places very abundant, on both the east and west coasts of Vancouver Island. Varieties are pink, yellow, and very rarely pure white. This shell is usually dredged in 10 or 20 fathoms, but may sometimes be found living on rocks between tides. On one occasion I dredged, in the course of a few hours, more than five hundred specimens of this species ; this was in the straits about one mile from Victoria.

Many specimens are found covered with a sponge, *Myxitis parasitica*, Lambe. This sponge when living is of a bright yellow colour, and the Pectens so covered, as they are taken from the dredge, have the appearance of small oranges.

Dr. Dawson found a valve of *P. hastatus* with a specimen of *Bivonia compacta* attached. I believe, however, that the *Bivonia* is more usually found on a gasteropod—*Pachypoma inæquale.*

11. Pecten rubidus, Hinds.

Zool. Voy. Sulph., vol. ii., p. 61, pl. xvii., fig. 5 (1844).

This is usually considered to be a variety of the last species, and perhaps it may be so.

It is not rare near Victoria, occurring with *P. hastatus*, but in this locality it is always readily separable from that species and does not show any intermediate forms. The sculpture is not nearly so rough as in *P. hastatus*, the ribs are equal and more numerous, the shape is rounder, and the colours duller.

12. Pecten (Pseudamusium) Vancouverensis, Whiteaves.

Ottawa Naturalist, December, 1893, p. 133, pl. i., figs. 1, 1*a*.

This little shell was first found by Dr. Dawson in 1885, in Forward Inlet, Quatsino Sound.

It was recorded by Mr. Whiteaves as *P. Alaskensis*, Dall (see below), but he has corrected this error, and described the species as new in his paper above cited.

I obtained two specimens of *P. Vancouverensis* in Departure Bay in August, 1888, and these were compared with the Pectens in the British Museum, through the kindness of Mr. E. A. Smith, and with those in the United States National Museum by Dr. Dall and pronounced distinct. Some conchologists, however, have inclined to the view that this may be

the young of *P. caurinus*, to which, to the naked eye, it bears some resemblance.

Last summer, in company with Prof. Macoun, I dredged a series of various ages in Departure Bay, and I am satisfied that I have adult shells. The type specimen measures 7·5 × 7·75 × 2·25 mm., and is the largest I have seen.

13. Pecten (Pseudamusium) Alaskensis, Dall.

Amer. Jour. Conch., vol. vii., p. 155, pl. xvi., fig. 4 (November, 1871).

This species, with which the last named was at first confounded, did formerly inhabit our seas, as is proved by the presence of the fossil shells in a Pleistocene deposit at Point Holmes, Comox. Valves, collected and kindly given to me by Dr. Newcombe, are in my cabinet from this locality. The species is probably still living in our northern waters.

P. Alaskensis and the fry of *P. caurinus* are figured in one of the valuable and cheap United States Government publications.[1]

This inexpensive work is within the reach, and should be in the possession, of every American conchologist. The figures alluded to are on plate v., and should be compared with that of *P. Vancouverensis* in the "Ottawa Naturalist."

HINNITES, Defrance.

14. Hinnites giganteus, Gray.

Hinnita gigantea, Gray, Ann. Phil., vol. xii., p. 103 (Aug., 1826).

Not rare, being found in all the localities examined. It occurs attached to boulders from extreme low water to twenty or more fathoms in depth. Dr. Dawson found it at Queen Charlotte Islands, and in 1885 in several more southerly localities. My largest specimen is 175 × 138 mm., but I have no doubt that these dimensions are often exceeded.

LIMATULA, Searles-Wood.

15. Limatula subauriculata, Montagu, sp.

Pecten subauriculatus, Montagu, Test. Brit., suppl. p. 63, p. xxix., fig. 2 (1808).

This species rests its claim to a place on our list upon two living specimens dredged by Dr. Dawson in 1885, one in Forward Bay, Johnston Strait, and the other in Alert Bay, Queen Charlotte Sound. Both

[1] "Bulletin of the United States National Museum No. 37," entitled "A Preliminary Catalogue of the Shell-bearing Marine Mollusks and Brachiopods of the South-eastern Coast of United States."

specimens are in the museum of Geological and Natural History Survey at Ottawa. *L. subauriculata* is a shell of very wide range, occurring on both sides of the Atlantic from the extreme north to the Canary Islands on the east and to Florida on the west side of the ocean.

Its range in depth, according to Dr. Dall, is "6 to 843 fathoms." It has also a considerable range in *time*, being, according to Jeffreys, a fossil of the British Coralline Crag.

Being rather common in the Californian region, and also to the north of us, it is to be expected that it will be found in other localities on the Vancouver coasts.

BRYOPHILA, Carpenter.

16. Bryophila setosa, Cpr.

Ann. Mag. Nat. Hist., series 3, vol. xiii., p. 314 (April, 1864).

Described from Cape St. Lucas (Xantus) and recorded also from Californian localities.

Our first British Columbian record is that of Dr. Dawson: "Virago Sound, Queen Charlotte Islands, in 8-15 fathoms, 4 fine living specimens."

I have a single specimen which was picked up on the sands at Alert Bay by Mr. E. S. Wilkinson, and which, from a comparison with one of Mr. Xantus's original lot, I believe to belong to this species.

MYTILUS, Linne.

17. Mytilus Californianus, Conrad.

Journ. Acad. Nat. Sci. Phila., vol. vii., pt. 2, p. 242, pl. xviii., fig. 15 (1837).

Common between tides and growing to a very large size. It is eaten by the Indians, and in its season is often to be seen on sale in the Victoria fish stores.

18. Mytilus edulis, Linne.

Syst. Nat., ed. xii., vol. i., pt. 2, p. 1157, no. 253 (1767). = *M. trossulus*, Gould, and many other synonyms.

Everywhere between tides. It is regularly on sale in Victoria, but is not valued as an article of food to anything like the same extent as in Europe or eastern America.

M. edulis has a very extended range, being found throughout the whole northern hemisphere.[1]

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[1] Northern localities for *M. edulis*, and for the following British Columbian species, are given in a "Catalogue of shells from Bering Sea and the adjacent portions of the Arctic Ocean" which was contributed by Dr. Dall, 20 years ago, to the Proceedings of the Californian Academy of Sciences (vol. 5, p. 246-253, 1874): *Mytilus*

MODIOLA, Lamarck.

19. Modiola recta, Conrad.

Journ. Acad. Nat. Sci. Phila., vol. vii., pt. 2, p. 243, pl. xix., fig. 1 (1837). Var = *Mytilus (Modiola) flabellatus* Gould, Proc. Bost. Soc. Nat. Hist. vol. iii., p. 343 (Dec., 1850); and U. S. Expl. Exped., Mollusca, p. 453, fig. 561 and 561a (1852).

A fine, large species, attaining sometimes to a length of seven inches. It has not as yet been found commonly in our waters, but perhaps it only needs searching for.

Dr. Newcombe has taken it in Ganges Harbour, Salt Spring Island, and at Clayoquot Sound. I have found it at Victoria, and have received specimens from the west coast of Vancouver Island. According to Carpenter, our local form of this species is the *M. flabellata* of Gould, which is broader than the typical *M. recta* of Conrad.

20. Modiola modiola, Linne, sp.

Mytilus modiolus, Linne, Syst. Nat., ed. xii., vol. i., pt. 2, p. 1158, no. 256 (1767).

Common everywhere. The deep water forms are much larger than the between tides varieties, attaining a length of five inches. Jeffreys (Brit. Conch., vol. ii., p. 113) records specimens, from the Northumberland coast, measuring 9¼ inches in length and proportionately broad.

ADULA, H. and A. Adams.

21. Adula stylina, Carpenter.

Rept. Brit. Assoc., 1863, p. 644 (August, 1864); and Ann. Mag. Nat. Hist., 3rd series, vol. xiv., p. 425 (Dec., 1864).

Found boring in soft rock between tides; near Victoria, Lord and Newcombe; Sooke Harbour, Professor Macoun.

MODIOLARIA, Beck.

22. Modiolaria lævigata, Gray, sp.

Modiola lævigata, Gray, Suppl. to App. to Parry's Second Voyage (1824).

Not uncommon in 10 to 30 fathoms, Victoria and Nanaimo. Dr. Dawson found a living specimen associated with *Saxicava rugosa*, at low

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edulis, *Modiola modiola*, *Modiolaria nigra*, *M. lævigata*, *M. marmorata*, *Nucula tenuis*, *Yoldia limatula*, *Leda minuta*, *Venericardia borealis*, *Lucina borealis*, *Serripes Groenlandicus*, *S. Laperousii*, *Macoma nasuta*, *M. edentula*, *M. inconspicua*, *Standella falcata*, *Mya truncata*, *Saxicava rugosa*, *Belæturricula*, *Admete Couthouyi*, *Buccinum Moerchianum*, *Chrysodomus fornicatus*, *C. liratus*, *Trophon multicostatus*, *T. orpheus*, *Purpura lima*, *Trichotropis cancellata*, *Mesalia reticulata*, *Natica clausa*, *Lunatia pallida*, *Acmæa patina*, *Cryptobranchia concentrica*, *Margarita helicina*, and *Tonicella lineata*.

Further information as to the northern range of our shells is given in later papers by the same author, reference to which will be found below under,—*Cryptodon sericatus*, *Macoma edentula*, *Penitella penita*, and *Tritonium Oregonense*.

water at Port Neville, near Johnston Strait. This would be an unusual station for the species, as it is generally found in deeper water and completely encased in a "nest" constructed chiefly of its own byssal threads.

23. Modiolaria nigra, Gray, sp.

Modiola nigra, Gray, Suppl. to App. to Parry's First Voyage, p. 244.

Distribution and station similar to those of *M. lævigata*, but the present species does not construct a "nest."

24. Modiolaria Taylori, Dall, MS.

This species has been found by me abundantly at Victoria, between tides, nestling at the roots of corallines. It is a small species not exceeding half an inch in total length and resembling in habit *M. discors*, Linne, of British seas.

This species has not been described, but has been widely distributed under Dr. Dall's manuscript name.

25. Modiolaria marmorata, Forbes, sp.

Mytilus marmoratus, Forbes, Malac. Monen., p. 44.

Recorded by Carpenter in his "Supplementary Report" as from Puget Sound (Kennerley, one specimen), with the remark, "Exactly accords with Atlantic specimens."

I was inclined to think at one time that the last named species might be the one intended, but it is so very different to *M. marmorata*, that Dr. Carpenter could not have made such a mistake. Moreover, I find that *M. marmorata* is on record from several other localities in the Pacific Ocean both to the north and the south of us. It is also found, according to Jeffreys,[1] in Japan.

CRENELLA, Brown.

26. Crenella decussata, Montagu, sp.

Mytilus decussatus, Mont., Test. Brit., suppl. p. 69 (1808).

Common in ten to twenty-five fathoms and probably to greater depths. Our shells are much larger than Atlantic specimens. Mr.

[1] "On some Species of Japanese Marine Shells and Fishes which inhabit also the North Atlantic," by J. Gwyn Jeffreys in Journal of the Linnean Society (Zoology), vol. xii., p. 100, November, 1874. In this paper Dr. Jeffreys mentions more than forty species of mollusca common to Japanese and European waters, and, as might be expected, the majority of these species occur also on the West American coast. Several additions to the list have been made by subsequent writers.

Whiteaves gives the dimensions of a specimen dredged by Dr. Dawson in Alert Bay at 12 × 11 × 7·5 mm., and I have a shell slightly larger even than this.[1]

According to Dr. Dall's arrangement, which we are following, the suborder *Naiadacea* will come in here. We have two species of this order, of course inhabiting fresh water, and belonging to the family *Unionidæ*. They are :

27. ANODONTA NUTTALLIANA, Lea.

28. MARGARITANA MARGARITIFERA, Linne, sp.

AXINÆA, Poli.

29. AXINÆA SEPTENTRIONALIS, Middendorff, sp.

Pectunculus septentrionalis, Midd., Mal. Ross., pt. iii., p. 67, pl. xxi., fig. 1-3 (1849), var. = *A. subobsoleta*, Cpr., Rept. Brit. Assoc., 1863, p. 644 (Aug., 1864); and Ann. Mag. Nat. Hist., 3rd series, vol. xiv., p. 425 (Dec., 1864).

This species does not occur in the neighbourhood of Victoria, so far as I have observed. It is found, however, not uncommonly on the western and northern coasts of Vancouver Island and at the Queen Charlotte Islands. (Dawson.)

Our shell is the *A. subobsoleta* of Carpenter, but its specific identity with the *septentrionalis* of Middendorff is doubted by some conchologists.

NUCULA, Lamarck.

30. NUCULA CASTRENSIS, Hinds.

Proc. Zool. Soc. London, 1843, p. 98; and Zool. Voy. Sulph., vol. ii., p. 63, pl. xviii., fig. 5 (1844), = *N. Lyalli*, Baird, Proc. Zool. Soc. London, 1863, p. 71.

This shell, which is undoubtedly the *N. Lyalli* of Baird, and almost certainly the *N. castrensis* of Hinds, is the commonest bivalve shell occurring in our seas. In Departure Bay last year I dredged more than 2,000 specimens of it in one day. Dr. Dawson dredged it at the Queen Charlotte Islands and in many localities to the north of Vancouver Island.

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[1] Since writing the above I have had occasion to examine the description and figures of the true *C. decussata* of the Atlantic, and I find that our British Columbian shells do not belong to that species at all. Mr. Whiteaves, in his account of Dr. Dawson's collections, has twice recorded our shells as *C. decussata*, and as the species had already been found on the Californian coast, I suppose we accepted his determination of the shell without question. Our species may be *C. faba*, O. Fab., but unfortunately I cannot at this moment refer to either descriptions or specimens of this species.

31. NUCULA TENUIS, Montagu, sp.

Arca tenuis, Mont., Test. Brit., Suppl. p. 56, pl. xxix., fig. 1 (1808).

Occurs with the last named species, but is not quite so common.

LEDA, Schumacher.

32. LEDA FOSSA, Baird.

Proc. Zool. Soc. London, 1863, p. 71.

This species was described from a single specimen taken by Dr. Lyall in Esquimalt Harbour. It was also represented by a single specimen in Dr. Kennerley's collection.

Though *L. fossa* is very abundant in the "Leda clay" of Victoria, I have never succeeded in finding recent specimens. Mr. Whiteaves records with a query "a single worn valve," Duncan Bay, V. I. (Dr. Dawson.)

33. LEDA MINUTA, Müller, sp.

Arca minuta, Müll., Prodr. Zool. Dan., p. 247, no. 2985 (1776).

This is the common *Leda* at Victoria and northward to the Queen Charlotte Islands. It is much smaller than *L. fossa*, and its sculpture is quite different. I have not yet found this species in the Leda clay.

34. LEDA ACUTA, Conrad.

= ? *L. cœlata*, Hinds.
= ? *L. cuneata*, Sby.

There is certainly a third species of *Leda* in our seas, but I am not sure what it should be named. Mr. Whiteaves, in his paper on the Queen Charlotte Islands Mollusca, records a single valve from Houston-Stewart Channel as *L. cœlata*, Hinds.

In his next paper (Trans. Roy. Soc. Can., 1886) he refers ten shells of the same species from Quatsino Sound to *L. acuta*, but suggests, quoting Drs. Dall and Cooper, that *acuta*, Conrad, *cœlata*, Hinds, and *cuneata*, Sby., are one and the same species. I have not access to the literature or specimens necessary to a decision on such a point, and therefore follow Whiteaves in adopting the name *L. acuta*, but I may say that the shells from Quatsino Sound above mentioned are not conspecific, in my opinion, with some received as *L. acuta* from California (Hemphill).

YOLDIA, Möller.

35. YOLDIA THRACIÆFORMIS, Storer, sp.

Nucula thraciæformis, Storer, Bost. Jour. Nat. Hist., vol. ii., no. 1, p. 122, figure (1838).

Two small living specimens, Forward Inlet, Quatsino Sound, Dr. Dawson.

I do not know of any other record of the occurrence of this eastern American species on the Pacific coast.

36. YOLDIA LANCEOLATA, J. Sowerby, sp,

Nucula lanceolata, J. Sby., Mineral Conchology,

Fairly common at Victoria, Nanaimo, etc., and occurring also at the Queen Charlotte Islands and in Quatsino Sound (Dawson).

The "very large" specimens recorded from Comox by Dr. Newcombe should probably be referred to the next species.

37. YOLDIA SEMINUDA, Dall.

Amer. Journ. Conch.,[1] vol. vii., p. 153 (Nov., 1871).

This species might be mistaken at first sight for *Y. lanceolata*, but when carefully examined it is seen to be quite distinct. It is a larger species than *lanceolata*, and the diagonal sculpture does not extend beyond the middle line of the shell, while in the last named species it reaches to the anterior margin.

Y. seminuda was described from St. Paul's Harbour, Radiak, 17 fms. My specimens were dredged outside Victoria Harbour, and the species has not so far been recognized elsewhere in the province.

38. YOLDIA LIMATULA, Say, sp.

Nucula limatula, Say, American Conchology, pt. ii., pl. xii. (April, 1831).

I dredged this species in Departure Bay in 1888, and near Victoria in 1891. It is like the two last named species in colour, but lacks the diagonal grooves they both possess.

This shell was identified for me by Dr. Dall.

39. YOLDIA, species.

Three fine specimens of a *Yoldia* that I have not yet identified were obtained last year in Sooke Harbour by Professor Macoun. The species resembles *Y. limatula* in colour, but differs in its very peculiar shape.

40. YOLDIA AMYGDALEA. Valenciennes.

Zool. Voy. Venus, Mollusca, pl. xxiii., fig. 6 (1846).

This species has been dredged at Victoria, Departure Bay and Comox, but appears to be rather rare. Its dark colour and the absence of the diagonal sculpture distinguish it from the preceding species.

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[1] The paper in which *Y. seminuda* and some seven or eight others of our British Columbian species are described is entitled "Descriptions of 60 new forms of Mollusks from the west coast of North America and the North Pacific Ocean, with notes on others already described." It was published in the American Journal of Conchology for 1871, vol. vii., pp. 93 to 160, plates 13 to 16.

Mr. E. A. Smith (in Ann. Mag. Nat. Hist., series 5, vol. vi., p. 289 [1880]) described *Yoldia Vancouverensis*, n. sp., from a specimen taken near Victoria. Judging by the description, *Vancouverensis* must be placed in the synonymy of *Y. amygdalea.*

VENERICARDIA, Lamarck.

41. Venericardia ventricosa, Gould, sp.

Cardita ventricosa, Gould, Proc. Bost. Soc. Nat. Hist., vol. iii., p. 276 (July, 1850); and U. S. Expl. Exped., Mollusca, p. 417, figs. 532, 532*a* (1852).

Very common, occurring with *Nucula castrensis* in all localities yet examined. Our shells are certainly the *V. ventricosa* of Gould, but this species was considered by Carpenter to be a variety only of *V. borealis*, Conrad (Amer. Mar. Conch.), and this last is consequently the name usually given in our lists. Lately, however, Dr. Stearns[1] has figured and compared the two forms, and has pronounced them to be distinct.

Mr. Whiteaves (in Rept. Prog. Geo. Surv. Canada, 1878-79) speaks of *both* forms as occurring in Dr. Dawson's Queen Charlotte Islands collection. All the local specimens I have seen are unmistakably *ventricosa.*

CARDITAMERA, Conrad.

42. Carditamera subquadrata, Carpenter, sp.

Lazaria subquadrata, Cpr., Rept. Brit. Assoc., 1863, p. 642 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xv., p. 178 (March, 1865).

This shell was first recorded from these waters by Carpenter on the strength of a single valve in Swan's collection; exact locality not stated. Single valves are not uncommon among shells brought by the Indians from the western and northern coasts, and I have myself found valves on the beaches near Victoria. So far, however, the species has not been found here alive.

MIODON, Carpenter.

43. Miodon prolongatus, Carpenter.

Rept. Brit. Assoc., 1863, p. 642 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xiv., p. 424 (December, 1864).

This is not a common shell with us. A few specimens have been found at Victoria, Departure Bay, and at Salt Spring Island, in some instances in sand between tide marks, and in others in deeper water.

Further to the north it appears to be more plentiful, for Mr.

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[1] "Scientific Results of Explorations by the United States Fish Commission steamer Albatross. XVII. Descriptions of new West American Land, Fresh-water and Marine Shells, etc." Proc. U. S. Nat. Museum, vol. xiii., no. 813 (1890).

Whiteaves records it from "Dolomite Narrows, abundant; mouth of Cumshewa Harbour, in twenty fathoms, several; Houston-Stewart Channel, in fifteen to twenty fathoms, three or four specimens."

ASTARTE, J. Sowerby.

44. Astarte undata, Gould.

Invertebrata of Massachusetts, p. 80 (1841); ed. ii., p. 121.

This species was recorded by Mr. Whiteaves from Metlakatla in 1878 as *Astarte semisulcata*, Leach ?

In 1886, after an examination of the specimens collected by Dr. Dawson to the north of Vancouver Island, he withdrew this name and substituted, and we think rightly, *A. undata*, Gould, which name we have adopted for our largest *Astarte*. This is not by any means so abundant a shell here as is the next species, but it is fairly common at Victoria and in other localities in which dredging has been done on the eastern and northern coasts of Vancouver Island.

45. Astarte Esquimalti, Baird, sp.

Crassatella Esquimalti, Baird, Proc. Zool. Soc., London, 1863, p. 70, pl. ii., fig. 15. = *Rictocyma mirabilis*, Dall, Amer. Jour. Conch., vol. vii., p. 151, pl. xiv., fig. 6 (Nov., 1871).

This is our commonest *Astarte*, and may be easily distinguished by its smaller size and wavy sculpture from the last named species. It is rather rare at Victoria but is abundant at Nanaimo and Comox, and was found by Dr. Dawson at several points at the north of Vancouver Island, and also at the mouth of Cumshewa Harbour, Queen Charlotte Islands.

46. Astarte compacta, Carpenter.

Rept. Brit. Assoc., 1863, p. 642 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 57.

A single living specimen was collected by Dr. Kennerley in Puget Sound. Dr. Carpenter described it as "*Astarte* (? var.) *compacta*," and suggested that it might prove to be identical with *A. compressa*, Montagu, a European species.

I do not think that any further specimens of this species ? have been found.

KELLIA, Turton.

47. Kellia Laperousii, Deshayes, sp.

Chironia Laperousii, Desh., Rev. Zool. Soc. Cuv., p. 357 (Dec., 1839); and Mag. de Zool. (Guerin's), pl. xii. (1841); var. *Chironii*, Cpr., Rept. Brit. Assoc., 1863, p. 643 (Aug., 1864); and Jour. de Conch., vol. xii., p. 136 (April, 1865).

This is a very common species usually occurring in the interior of dead bivalve shells. It has been found in all localities in British

Columbia in which search has been made. At Vesuvius Bay, I obtained very fine specimens from the burrows of *Penitella penita.* In many cases the dead *Penitella* inclosed *Saxicava rugosa,* also dead, and containing in its turn numerous specimens of *Kellia.*

The variety *Chironii* is characterized by Carpenter as "thinner, less transverse, margins rounded," but the shells of this species are so very variable in shape that it seems hardly necessary to apply a separate name to a particular form.

Fine specimens of *K. Laperousii* frequently exceed 25 mm. in length.

48. KELLIA SUBORBICULARIS, Montagu, sp.

Mya suborbicularis, Mont., Test. Brit., p. 564, and suppl. p. 39, pl. xxvi., fig. 6 (1803 and 1808).

This does not appear to be so common a shell as the last named, but I think that in many cases it may have been passed over as the young of *Laperousii.*

I have found the two species together at Victoria and Salt Spring Island, and Dr. Dawson dredged it in several localities near the Queen Charlotte Islands.

PYTHINA, Hinds.

49. PYTHINA RUGIFERA, Carpenter.

Rept. Brit. Assoc., 1863, p. 643 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 57.

This species was described from two living specimens obtained by Dr. Kennerley in Puget Sound. No other specimens have been found so far as I am aware.

LEPTON, Turton.

50. LEPTON RUDE, Whiteaves.

Rept. Prog. Geol. Surv. Canada, 1878-79, p. 198B, fig. 2.

This curious shell is not uncommon on muddy shores, where it is to be found attached to the ventral segments of a crustacean, *Gebia Puget-tensis.*

The prawn in question is a common species, but in most localities only a small percentage will be found with the attached *Lepton.*

LASÆA, Leach.

51. LASÆA RUBRA, Montagu, sp.

Cardium rubrum, Mont., Test. Brit., Suppl. p. 83, pl. xxvii., fig. 4 (1808).

Common near Victoria, generally at the roots of seaweed in tide pools. Dr. Kennerley obtained a single specimen of this species in Puget

Sound, but no recent collectors, with the exception of myself, seem to have observed it.

As Carpenter remarks, our shells "exactly accord with British specimens."

TELLIMYA, Brown.

52. TELLIMYA TUMIDA, Carpenter.

Rept. Brit. Assoc., 1863, p. 643 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 58.

Common in sand between tide marks all round the coast of Vancouver Island and northward to Queen Charlotte Islands.

The specimen recorded by Whiteaves from Virago Sound as *Turtonia minuta*, O. Fab., belongs to the present species. I believe that a species of *Turtonia* is found in the Alaska province, but our shell does not belong to that genus.

CRYPTODON, Turton.

53. CRYPTODON SERICATUS, Carpenter.

Rept. Brit. Assoc., 1863, p. 643 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 57.

Extremely common in sand below low water mark wherever we have dredged—Esquimalt, Victoria, Sooke, Departure Bay, Comox, west coast of Vancouver Island, and the Queen Charlotte Islands.

54. CRYPTODON FLEXUOSUS, Montagu, sp.

Tellina flexuosa, Mont., Test. Brit., suppl. p. 72 (1808).

A very rare species in this province, though common in the British seas.

It was first found on the west American coast by Dr. J. G. Cooper who dredged it in 120 fathoms near the Catalina Islands.

Dr. Dawson dredged three perfect specimens in 111 fathoms at Dixon entrance, Queen Charlotte Islands, and obtained it also in shallow water at False Bay, Straits of Georgia (four specimens), and Quatsino Sound (two specimens). I have myself dredged dead valves in Departure Bay.

Jeffreys gives its range in the British seas as three to eighty-seven fathoms.

LUCINA, Bruguière.

55. LUCINA TENUISCULPTA, Carpenter.

Rept. Brit. Assoc., 1863, p. 642 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 57.

A very common species, having the same station as *Cryptodon sericatus*, and occurring in the same localities. It varies a good deal in

shape, being at times very tumid and at other times much flattened. Fine specimens from Sooke measure $9\frac{1}{2} \times 11 \times 4$ mm.; others, from Departure Bay, of a quite different shape, $9 \times 9 \times 6\frac{1}{2}$ mm.

56. LUCINA ACUTILINEATA, Conrad.

Small living specimens and larger dead ones have been dredged in several localities from Victoria to Queen Charlotte Islands. Dr. Newcombe found the dead valves abundant on the shore at low water at Clayoquot Sound.

In Whiteaves's papers this species appears as *Lucina filosa*, Simpson, but Stearns has recently shown that the east coast species is different, and that our shell should be styled *Lucina acutilineata*, Conrad. Dr. Carpenter supposed this last to be a form of the European *L. borealis*, Linne, and Jeffreys could see no good reason for separating *borealis* and *filosa*.

The three forms are nearly allied and, I should say, are at best geographical varieties of one species. If they are to be united then *borealis* is of course the oldest name.

DIPLODONTA, Brown.

57. DIPLODONTA ORBELLA, Gould, sp.

Lucina orbella, Gould, Proc. Bost. Soc. Nat. Hist., vol. iv., p. 90 (November, 1851).

Not common. I have only found dead shells which I dredged in Departure Bay, but Dr. Dawson obtained living specimens at the Queen Charlotte Islands by dredging, and at low water at Malaspina Inlet, and again between Nahwitti Bar and Quatsino Sound, Vancouver Island.

Dr. Newcombe has reported it as being found in *mud* at Comox and Salt Spring Island. In California it is not uncommon and is found, according to Mr. Orcutt,[1] "in holes in rocks or in dead bivalves."

CARDIUM, Linne.

58. CARDIUM NUTTALLI, Conrad.

Jour. Acad. Nat. Sci. Phila., vol. vii., pt. 2, p. 229, pl. xvii., fig. 3 (1837).

This species is now generally considered to be distinct from the *Pectunculus corbis* of Martyn with which Carpenter united it. It is a

[1] "Notes on the Mollusks of the vicinity of San Diego, Cal., and Todos Santos Bay, Lower California," Proc. U. S. Nat. Mus., vol. viii., 1885. This paper and the following: "Annotated list of shells of San Pedro Bay and vicinity," by Mrs. Burton Williamson, Proc. U. S. Nat. Mus., vol. xv., 1892, as well as the earlier "Geographical Catalogue of Mollusca" (1867), of Dr. J. G. Cooper, and the Monterey list of the same author (Amer. Jour. Conch., vol. vi., 1870), should be consulted for information as to the southern range of our species.

fine species and occurs commonly in sand between tides on all our coasts. It is largely consumed by Indians and others in the proper season.

59. Cardium Californiense, Deshayes.

Rev. Zool. Soc. Cuv., p. 360 (Dec., 1839); and Mag. de Zool. (Guerin's), pl. xlvii. (1841); var. = *C. blandum*, Gould, Proc. Bost. Soc. Nat. Hist., vol. iii., p. 276 (July, 1850); and U. S. Expl. Exped., Mollusca, p. 418, fig. 534, 534a (1852).

This cockle is never found living above low water mark, but has been dredged, though not very abundantly, wherever dredging has been carried on.

At Victoria, where we have had the opportunity to examine a number of specimens; there appear to be two varieties differing in shape and number of ribs. Gould in his description of *Cardium blandum*, which clearly refers to our shell, speaks of this variation in form. The ribs are often nearly 50 in number, and the interior of the shell is frequently more or less tinted with rose colour.

There is a third species of *Cardium* (the name of which I have not been able to ascertain) abundant in the Leda clay at Victoria.

SERRIPES, Beck.

60. Serripes groenlandicus, Auct.

Cardium Groenlandicum, etc., Chemnitz, Conch. Cab., vol. vi., p. 202, pl. xix., fig. 198. = *edentulum*, Montagu, 1808 (according to Carpenter).

Chemnitz was not binomial in volume vi., and his name is not therefore entitled in strictness to priority. It would serve no good purpose however to change a name that has come into universal use.

I have dredged dead specimens of this shell at Victoria and Departure Bay, and Dr. Newcombe has obtained it in these places and alive in Deep Bay, near Comox. He also reports it as fossil in the boulder clay in various localities.

61. Serripes laperousii, Deshayes, sp.

Cardium Laperousii, Desh., Rev. Zool. Soc. Cuv., p. 360 (Dec., 1839); and Mag. de Zool. (Guerin's), pl. xlviii. (1841).

According to Mr. Whiteaves a single living specimen of this species was dredged by Mr. Richardson, near Victoria, in 1875, but no other specimens have been obtained here so far as I know.

62. SERRIPES CENTIFILOSUM, Carpenter, sp.

Cardium centifilosum, Cpr., Rept. Brit. Assoc., 1863, p. 642 (August, 1864); and Proc. Cal. Acad. Nat. Sci., vol. iii. (1866).
= *C. Adamsi*, Tryon, 1871.
= *C. modestum*, Ad. and Rve., 1850, not Philippi, 1848.
= *C. Richardsoni*, Whiteaves, 1878.

Tryon, in his catalogue of *Cardiidæ*, 1871, ignores Carpenter's name and re-names the species *Adamsi*, on the ground that *modestum* is preoccupied by Philippi.

Mr. Whiteaves, in the "Ottawa Naturalist" for December, 1893, p. 134, acknowledges his *C. Richardsoni* to be a synomyn of *C. modestum*, Ad. and Rve., but says that he described it "as a new species almost entirely on the authority of Dr. Carpenter," who would thus seem to have failed to recognize his own *C. centifilosum*. There is little doubt, however, that all the above mentioned names refer to one and the same species.

S. centifilosum is not a common shell with us. Mr. Richardson dredged a single living specimen (the type of *C. Richardsoni*) in 30-50 fathoms, between Race Island lighthouse and Victoria Harbour. I have dredged a few living and several dead shells in the same locality and in Departure Bay. Other recent collectors do not seem to have met with it.

VENUS, Linne.

63. VENUS KENNERLEYI, Reeve.

Conch. Icon., Mon. of Venus, no. 41, 1863.

This fine species is not very common. Richardson dredged it alive at Victoria; Dawson took it in some numbers at the Queen Charlotte Islands and subsequently in Duncan and Freshwater Bays. I have myself dredged it alive in Departure Bay, and Dr. Newcombe has found it both living and dead at Victoria. It is a dull, heavy shell with strong concentric ribs and distinctly crenulated edges to the valves

PSEPHIS, Carpenter.

64. PSEPHIS TANTILLA, Gould, sp.

Venus tantillus, Gould, Bost. Jour. Nat. Hist., vol. vi., no. 3, p. 406, pl. xv., fig. 10 (October, 1853).

Plentiful in sand between tide marks near Victoria, and also common, according to Dr. Newcombe, at Comox and Clayoquot. Professor Macoun also collected it at Sooke. Dr. Dawson did not find it at the Queen Charlotte Islands or elsewhere, but as he did very little shore collecting he might easily pass over so small a shell.

Gould's type was from Santa Barbara, and Dr. Cooper dredged the species in that neighbourhood in 12 to 20 fathoms. As stated above our specimens have all been taken between tides.

65. Psephis Lordi, Baird, sp.

Chione Lordi, Baird, Proc. Zool. Soc. London, 1863, p. 69, pl. ii., fig. 10.

This shell is quite as common as the last named, but as it inhabits deep water it can only be obtained by dredging. It has been found in nearly all the localities in which collections have been made. Dr. Newcombe speaks of finding it at extreme low water; Dr. Dawson, on the other hand, dredged it at a depth of 111 fathoms. Its usual station seems to be in clean sand in 10 to 30 fathoms in company with *Mesalia reticulata*, *Cryptodon sericatus*, etc. The absence of the purple stain readily distinguishes this species from *P. tantilla*, which is moreover a much smaller shell.

CLEMENTIA, Gray.

66. Clementia subdiaphana, Carpenter.

Rept. Brit. Assoc., 1863, p. 640 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 56.

Generally distributed, but not common. It has been dredged by Dr. Dawson in Quatsino Sound and at the Queen Charlotte Islands; by Dr. Newcombe at Comox, Clayoquot, etc.; by myself at Departure Bay and Victoria. The young shells are generally coated with sand, like *Lyonsia* and some other species.

TAPES, Muhlfeldt.

67. Tapes staminea, Conrad, sp.

Venus staminea, Conr., Journ. Acad. Nat. Sci. Phila., vol. vii., pt. 2, p. 250, pl. xix., fig. 14 (1837).

= *Venerupis Petitii*, Deshayes, 1839.

= *Venus rigida*, Gould (pars), 1850.

vars. = *diversa*, Sby.; *ruderata*, Desh.; *tumida*, Sby.; *orbella*, Cpr., etc.

Very common between tides, generally among stones on muddy shores. This species varies much in shape and sculpture. Sometimes it is found in the burrows of *Penitella penita* and is distorted after the manner of *Petricola*. The colour is also variable, the common variety being white, but some specimens are almost as brightly coloured as the Californian *Tapes grata*. An extreme variety is dark chocolate colour.

Tapes staminea is a common article of food.

68. TAPES TENERRIMA, Gould and Carpenter.

Proc. Zool. Soc. London, 1856, p. 200; = *Venus rigida*, Gould (pars), 1850.

This fine species is not nearly so common as the last named. I have only found it in one locality, namely, Cadboro' Bay, near Victoria, where it occurs in sand between tide marks. Dr. Newcombe has found it in a similar situation at Clayoquot Sound.

In a systematic arrangement our nine species of fresh-water *Corbiculidæ* must be placed here.

They are:

69. SPHÆRIUM RHOMBOIDEUM, Say, sp.
70. " TUMIDUM, Baird.
71. " SPOKANI, Baird.
72. " RAYMONDI, J. G. Cooper.
73. PISIDIUM VARIABILE, Prime.
74. " ABDITUM, Haldeman.
75. " ULTRAMONTANUM, Prime.
76. " sp.
77. " sp.

All of the above have been taken by myself on Vancouver Island, except *S. tumidum* and *S. Spokani*, which were described by Baird from localities on the mainland of British Columbia.

SAXIDOMUS, Conrad.

78. SAXIDOMUS SQUALIDUS, Deshayes.

Brit. Mus. Cat. of Veneridæ, p. 188, no. 5 (1853).

Very common everywhere between tides, and largely used by Indians and others as an article of food.

PETRICOLA, Lamarck.

79. PETRICOLA CARDITOIDES, Conrad, sp.

Saxicava carditoides, Conrad, Jour. Acad. Nat. Sci. Phila., vol. vii., pt. 2, p. 255, pl. xx., fig. 8 (1837) + *Sax. Californica*, Conr., *op. cit.*, p. 256, pl. xx., fig. 9.

This is the name by which this shell has long been known, though there appear to be several older ones, *e. g.*, *nivea*, Chem., *rugosa*, Sby., and *tenuis*, Sby.

Carpenter records it from Puget Sound (Kennerley) and Vancouver Island (Swan). Richardson is said to have found four living specimens at Victoria in 1875, and Dr. Newcombe obtained young specimens at

Clayoquot last autumn. I do not know of any other record of its occurrence in this province, and I have never taken it myself.

PSAMMOBIA, Lamarck.

80. PSAMMOBIA RUBRORADIATA, Nuttall.

This species seems to be rare, or at any rate difficult to find. It was represented in the collections of Kennerley and Swan by dead shells, and single valves have been found in many localities on all our coasts from Victoria to the Queen Charlotte Islands. I have not seen living specimens, but I believe that Dr. Newcombe found a few at Comox and at Clayoquot.

MOERA, H. and A. Adams.

81. MOERA SALMONEA, Carpenter.

Rept. Brit. Assoc., 1863, p. 639 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xiv., p. 423 (1864).

Found by Dr. Dawson in several northern localities,—Quatsino Sound, Queen Charlotte Sound and Queen Charlotte Islands. Also by Dr. Newcombe at Clayoquot Sound. A few specimens were kindly given to me some years ago by Capt. Clarke, who had dredged them near Comox. I have not seen any specimens from Victoria or Nanaimo.

ANGULUS, Muhlfeldt.

82. ANGULUS MODESTUS, Carpenter.

Rept. Brit. Assoc., 1863, p. 639 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 56; var. = *A. obtusus*, Carpenter.

This little shell is common in sand between tides, and is sometimes found in deeper water. Dr. Dawson took it at the north of Vancouver Island, but not near the Queen Charlotte Islands, Dr. Newcombe found it at Clayoquot, and it is abundant at Victoria, Departure Bay and Comox.

83. ANGULUS VARIEGATUS, Carpenter.

Rept. Brit. Assoc., 1863, p. 639 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xiv., p. 424 (1864).

This species was one of Swan's additions to the Vancouver list, and it was stated by him to be "rare." Only a single specimen has been found here since Swan's time, and that has been recorded by Mr. Whiteaves as "a fully grown living specimen," taken by Dr. Dawson at Quatsino Sound in thirty to fifty fathoms. (Trans. Roy. Soc. Canada, 1886.) The record of *A. variegatus* in Mr. Whiteaves's earlier paper (in

Rept. Prog. Geo. Surv. Can., 1878-79) is said by him to be a misprint, and to refer to *Moera salmonea*. *A. variegatus* is not rare on the Californian coasts.

84. ANGULUS GOULDII, Carpenter.

A. Gouldii (Hanley, MS.), Cpr., Rept. Brit. Assoc., 1863, p. 639 (August, 1864); and Jour. de Conch., vol. xii., p. 132 (April, 1865).

This shell is recorded by Dr. Newcombe in his paper in the "Bulletin of the Natural History Society of British Columbia" as having been found by himself at Comox. He adds to his note: "Mr. Dall states that these may be the young of *T. inflatula*."

PERONÆA, Poli.

85. PERONÆA BODEGENSIS, Hinds, sp.

Tellina Bodegensis, Hinds, Zool. Voy. Sulph., vol. ii., p. 67, pl. xxi., fig. 2 (1844).

This species appears to be confined, in this province, to the western and northern coasts of Vancouver Island.

Dr. Dawson took six living specimens between Nahwitti Bar and Quatsino Sound, and Dr. Newcombe found specimens, also living, at low water at Clayoquot Sound.

I have seen a few specimens from other west coast localities, but have never taken this species on the eastern side of the island.

MACOMA, Leach.

86. MACOMA SECTA, Conrad, sp.

Tellina secta, Conr., Jour. Acad. Nat. Sci. Phila., vol. vii., pt. 2, p. 257 (1837).
= *ligamentina*, Deshayes, 1843. (A most appropriate name.)

Of our many native Macomas this is the first and finest. It is found in sand near low water in nearly all the localities examined; specimens from the west coast appearing to be rather larger and heavier than those from the neighbourhood of Victoria.

Dr. Newcombe, in his paper so often quoted, credits Dr. Dawson with having taken this species at the Queen Charlotte Islands, but I cannot find the record in Mr. Whiteaves's report of Dr. Dawson's collections. As before mentioned, Dr. Dawson does not appear to have made any special search for shore shells, and may therefore easily have overlooked this species, which, however, doubtless occurs in the localities he visited.

Carpenter speaks of a variety *edulis*, Nuttall, as being the northern form of *secta*, and as occurring in Puget Sound.

87. MACOMA NASUTA, Conrad, sp.

Tellina nasuta, Conrad, Jour. Acad. Nat. Sci. Phila., vol. vii., pt. 2, p. 258 (1837).

This and the next named species are very abundant between tides on all our coasts, and in their season are often exposed for sale in the Victoria markets.

88. MACOMA INQUINATA, Deshayes.

Proc. Zool. Soc. London, 1854, p. 357.

Very common; see note under last species.

89. MACOMA EDENTULA, Broderip and Sowerby, sp.

Tellina edentula, Br. and Sby., Zool. Jour., vol. iv., pt. 15, p. 363 (1829).

This is the name I apply to a *Macoma* that I have not infrequently dredged at Nanaimo (but always dead), and which I have also found living in sand between tides at Cordova Bay.

It bears some resemblance to a very large variety of *M. inconspicua*, and possibly the large specimens from False Head, Vancouver Island, recorded by Mr. Whiteaves as *M. inconspicua*, may prove to be the present species.

Dall's figure of his *Macoma Middendorffi* (= *edentula*, Middendorff, not Brod. and Sby.) Proc. U. S. Nat. Museum, 1886, pl. iv., fig. 11,[1] is wonderfully like some specimens of our shell.

90. MACOMA LATA, Gmelin, sp.

Tellina lata, Gmel., Syst. Nat., ed. xiii., vol. i., pt. 6, p. 3237. (1788).
= *T. calcarea*, Chemnitz. 1782. (Not binomial).
T sabulosa, Spengler. 1798.
T. proxima, Brown. Etc., etc.

This form is quite different to the one last named. I have found it (dead) wherever I have dredged, and it is a not uncommon fossil in the Leda clay. Dr. Dawson obtained living specimens by dredging at Dixon Entrance in 111 fathoms, and in Quatsino Sound in shallower water.

Mr. Whiteaves adopts the specific name *sabulosa* in his first report and *calcarea* in his second. As before mentioned (under *Serripes Grœnlandicus*), Chemnitz in volume vi. of the Conchylien Cabinet is not binomial, and therefore his name should not be used, and Spengler's name is ante-dated by the appropriate one of Gmelin.

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[1] In this paper, which is entitled "Supplementary notes on some species of Mollusks of the Behring Sea and vicinity," Dr. Dall has interesting notes on several of our species besides the *Macoma edentula*, namely:—*Mangilia levidensis*, *Bela sculpturata*, *Admete Conthonyi*, *Trophon muriciformis* (= *Dallii*), *T. orpheus*, *T. tenuisculptus* and *Alvania castanea*. Also excellent figures of *M. Middendorffi* (see above), *B. sculpturata*, *T. Dalli* and *A. castanea*. Dr. Dall has previously called attention to *M. edentula* in a paper in the same Proceedings, vol. vii., 1884, p. 347.

91. MACOMA EXPANSA, Carpenter.

Macoma (? v.) *expansa*, Cpr., Rept. Brit. Assoc., 1863, p. 639, (Aug., 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 56.

This is the name applied by Dr. Carpenter to some shells obtained by Dr. Kennerley in Puget Sound. Dr. Carpenter himself noted the close resemblance to *lata* = *calcarea*, and I suspect that *M. expansa* will prove to be only a variety of that species.

92. MACOMA INCONSPICUA, Broderip and Sowerby, sp.

Tellina inconspicua, Br. and Sby., Zool. Jour., vol. iv., pt. 15, p. 363 (1829); and Zool. Voy. Blossom, p. 153, pl. xli., fig. 6 (1839).

Very common and variable. Found everywhere in sand between tides.

Jeffreys and others have united this species with *Macoma lata*. By a similar process of lumping together allied forms, the number of species of *Macoma* may be considerably reduced, but there seems little doubt, to my mind, as to the specific distinctness of all the forms above enumerated. On this coast, at any rate, they do not seem to intergrade at all.

93. MACOMA CARLOTTENSIS, Whiteaves.

Rept. Prog. Geo. Surv. Canada, 1878-79, p. 196B, fig. 1 (1879).

This species is only known to us from the original description and specimens. The latter were obtained by Dr. Dawson in 1878 in "Virago Sound in from eight to fifteen fathoms, abundant."

94. MACOMA YOLDIFORMIS, Carpenter.

Rept. Brit. Assoc., 1863, p. 639 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 55.

Described from specimens from Puget Sound (Kennerley) and Vancouver Island (Swan). It has since been obtained by Dr. Newcombe and myself by dredging in various localities on both the east and west coasts of the island, and it is probably widely distributed.

The "*Macoma*, n. sp.," mentioned by Dr. Newcombe, in his list, as taken at Clayoquot Sound, seems to me to be identical with this species.

95. MACOMA INFLATULA, Dall.

(See note under *Angulus Gouldii*.)

Œdalina subdiaphana, Cpr., is in Dr. Newcombe's catalogue, with the note, "One living specimen at low water Clayoquot Sound." The

specimen, which I have seen, is not an *Œdalina*, but may belong to the last named species of *Macoma*.

CUMINGIA, Sowerby.

96. CUMINGIA CALIFORNICA, Conrad.

Journ. Acad. Nat. Sci. Phila., vol. vii., pt. 2, p. 234, pl. xvii., fig. 12 (1837).

This species is included in our list on the strength of Mr. Whiteaves's record (in the Ottawa Naturalist for December, 1893) of a single specimen collected by Professor Macoun in 1887 at Barclay Sound.

SEMELE, Schumacher.

97. SEMELE RUBROPICTA, Dall.

Amer. Jour. Conch., vol. vii., p. 144, pl. xiv., fig. 10 (November, 1871).

This is the shell that Californian conchologists, following Carpenter, called *S. rubrolineata*, Conrad, but Dr. Dall, believing, as Dr. Carpenter himself suspected, that it is not the species intended by Conrad, has redescribed it, with an excellent figure, in the American Journal of Conchology, *loc. cit.*

The shell is by no means common, but has been found, dead, at Victoria and Departure Bay, and, by Dr. Newcombe, at Clayoquot.

SILIQUA, Muhlfeldt.

98. SILIQUA PATULA, Dixon, sp.

Solen patulus, Dixon, Voyage, etc., p. 355, fig. 2 (1789).

This fine species is more common on the west and north than on the east coast of Vancouver Island, though both Dr. Newcombe and myself have dredged young specimens near Victoria.

Dr. Dawson found this shell dead on the beach at Masset and Rose Point, Queen Charlotte Islands, and Dr. Newcombe procured fine living specimens in the sands, between tides, at Clayoquot. I have received these shells also from other points on the west Vancouver coast.

I have not heard of this species being sold or used for food in this province, but the first discoverers of the shells, Captain Dixon's crew, are said to have preferred them to the cockles, *C. Nuttalli*, that abounded in the same locality.

SOLEN, Linne.

99. SOLEN SICARIUS, Gould.

Proc. Bost. Soc. Nat. Hist., vol. iii., p. 214 (May, 1850); and U. S. Expl. Exped., Mollusca, p. 387, fig. 501-501b (1852).

Generally distributed, but not easy to obtain, as it lives buried rather deeply in sand below low water-mark, and is consequently seldom

dredged except when very young or when dead. The dead shells in greater or less number have been found at Victoria, Departure Bay, Comox and Clayoquot.

SPISULA, Gray.

100. SPISULA FALCATA, Gould, sp.

Mactra falcata, Gould, Proc. Bost. Soc. Nat. Hist., vol. iii., p. 216 (May, 1850); and U. S. Expl. Exped., Mollusca, p. 393, fig. 506-506b (1852).

This species has been found dead by Dr. Dawson at the Queen Charlotte Islands, and by Dr. Newcombe at Comox and Victoria.

In Carpenter's "Supplementary Report" it is given as from Puget Sound (Kennerley) and Vancouver Island (Swan). I have not myself as yet succeeded in finding specimens.

101. SPISULA PLANULATA, Conrad, sp.

Mactra planulata, Conr., Journ. Acad. Nat. Sci. Phila., vol. vii., pt. 2, p. 240 (1837).

Of this species I have dredged numerous young specimens in Departure Bay. Dr. Newcombe has found it at Clayoquot, and Mr. Harvey at Comox.

Dr. Dall, finding the nomenclature of the Pacific coast *Mactridæ* in a very unsatisfactory condition, has been lately working up the subject. A first paper by him, entitled, "On the Species of *Mactra* from California," has appeared in the "Nautilus" for April of the present year and should be consulted for notes on our species.[1]

DARINA, Gray.

102. DARINA DECLIVIS, Carpenter.

Rept. Brit. Assoc., 1863, p. 637 (August, 1864); and Proc. Zool. Soc. London, 1865, p. 203.

A single shell, measuring 1·77 x ·85 x ·34 inches, was found at

[1] Since the above was written Dr. Dall has published several other papers on North American *Mactridæ*. In one of these entitled "Synopsis of the *Mactridæ* of Northwest America, South to Panama," published in the "Nautilus" for August, 1894, Dr. Dall names the northern species as follows:-

Mactra (Mactrotoma) Californica, Conrad. Fuca Strait to Central America.

Spisula (Hemimactra), polynyma, Stimpson, var. *Alaskana*, Dall. Icy Cape to Neeah Bay.

Spisula (Hemimactra catilliformis, Conrad. Neeah Bay to San Diego.

Spisula (Hemimactra) planulata, Conrad. Monterey to San Diego.

Spisula (Symmorphomactra) falcata, Gould. Comox to San Pedro, Cal.

I have not yet found specimens of the three first named species among our Vancouver shells, nor am I very confident as to the correctness of the identification of the specimens I have recorded above as *S. planulata*.

Vancouver Island by Dr. Forbes, and made the type of this species by Dr. Carpenter.

The latter remarks, in his note on the species, that it "may have been passed over as the young of *Machæra* (*Siliqua*) *patula*, to which it bears a strong external resemblance."

No further specimens seem to have been found.

TRESUS, Gray.

103. Tresus Nuttalli, Conrad.

Lutraria Nuttalli, Conr., Journ. Acad. Nat. Sci. Phila., vol. vii., pt. 2, p. 235, pl. xviii., fig. 1 (1837).

This is *the* clam of the North Pacific coast. It is very common on all our sandy beaches and is an important article of food among the Indians, who, in summer, collect and dry the animals for winter consumption. A little crab, *Pinnotheres faba*, Dana, finds its lodging within the valves of this shell.

THRACIA, Leach.

104. Thracia curta, Conrad.

Journ. Acad. Nat. Sci. Phila., vol. vii., pt. 2, p. 248, pl. xix., fig. 8 (1837).

This shell has not yet been found in any numbers, though it seems to be widely distributed.

Dr. Dawson took one specimen in Virago Sound, Queen Charlotte Islands, and a large single valve in Quatsino Sound. Dr. Newcombe has dredged it alive in Clayoquot Sound and at Comox, and I have dredged it alive at Departure Bay and have taken a few dead specimens near Victoria. A valve from the last named locality measured 57 x 46 mm., being a little larger than the one from Quatsino Sound of which Mr. Whiteaves gives the measurements (Trans. R. S. Can. 1886, sec. iv., p. 123).

105. Thracia beringi, Dall, MS.

This species has long been known to Dr. Dall, and though not yet described, I believe, has been distributed under the manuscript name *T. Beringi*.

In 1888, I dredged a large single valve (58 x 43 mm.) and a small number of young living specimens of this species in Departure Bay. These were all submitted to Dr. Dall who kindly determined them for me as above.

LYONSIA, Turton.

106. Lyonsia californica, Conrad.

Journ. Acad. Nat. Sci. Phila., vol. vii., pt. 2, p. 248, pl. xix., fig. 20 (1837).
= *nitida bracteata*, Gould; (according to Carpenter.)

Common everywhere in sand between tides. I have taken at Victoria an unusually large form which at first I was tempted to treat as a distinct species, but Dr. Dall who kindly examined it considers it to be merely a northern variety of *Californica.*

ENTODESMA, Philippi.

107. Entodesma saxicola, Baird, sp.

Lyonsia saxicola, Baird, Proc. Zool. Soc. London, 1863, p. 70, pl. ii., fig. 14.

Generally distributed ; living in crevices of the rocks between tide marks, but not found anywhere in large numbers.

MYTILIMERIA, Conrad.

108. Mytilimeria Nuttalli, Conrad.

Journ. Acad. Nat. Sci. Phila., vol. vii., pt. 2, p. 247, pl. xix., fig. 5 (1837).

Never yet found by us in any numbers but apparently generally distributed. Living specimens have been taken at the Queen Charlotte Islands and Victoria; dead shells at Comox ("very large" Harvey), Clayoquot Sound and elsewhere.

CUSPIDARIA, Nardo.

109. Cuspidaria pectinata, Carpenter, sp.

Neæra pectinata, Cpr., Rept. Brit. Assoc., 1863, p. 637 (Augt., 1864) ; and Proc. Acad. Nat. Sci. Phila., 1865, p. 54.

The generic name *Neæra*, Gray (1834), is said to be preoccupied in Diptera.

C. pectinata is recorded by Carpenter from Puget Sound (1 specimen, Dr. Kennerley). It seems to be quite a common shell with us, having been taken in from 10 to 20 fathoms, in all the localities in which we have dredged. The shells are usually somewhat less than half an inch in length, but Mr. Whiteaves records an extraordinarily large example from Quatsino Sound measuring 21 x 13 mm.

CLIDIOPHORA, Carpenter.

110. Clidiophora punctata, Conrad, sp.

Pandora punctata, Conr., Journ. Acad. Nat. Sci. Phila., vol. vii., pt. 2, p. 228, pl. xvii., fig. 1 (1837).

Not uncommon in California but only known from this province, at the time of Carpenter's report, by a single valve in Swan's collections. In 1892, however, Mr. E. S. Wilkinson brought dead valves from the west coast of Vancouver Island, and last year Dr. Newcombe found a number of dead shells and also dredged a few living specimens in clean sand in shallow water at Clayoquot Sound.

KENNERLIA, Carpenter.

111. Kennerlia grandis, Dall.

Pandora (Kennerlia) grandis, Dall., Proc. Cal. Acad. Sci., vol. vii. (1877).

Described from Unalashka. First found in British Columbian waters by Richardson in 1875. Afterwards in 1885 by Dr. Dawson, in Duncan Bay and Forward Bay. The only other locality in which it has been taken so far is near Victoria where it is not very rare in 10 to 30 fathoms, sand.

112. Kennerlia filosa, Carpenter.

Rept. Brit. Assoc., 1863, p. 638 (August, 1864); Proc. Zool. Soc. London, 1864, p. 602, and Proc. Acad. Nat. Sci. Phila., 1865, p. 55.

Much commoner than the last and more generally distributed. It has been dredged in 8 to 50 fathoms (sand) in Virago Sound, Queen Charlotte Islands, Quatsino Sound and Straits of Georgia, by Dr. Dawson; in Clayoquot Sound by Dr. Newcombe, and in Departure Bay (where it is common) and at Victoria by myself.

SPHÆNIA, Turton.

113. Sphænia ovoidea, Carpenter.

Rept. Brit. Assoc., 1863, p. 637 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 54.

Described from one living specimen taken by Dr. Kennerley in Puget Sound. I have no knowledge of any further specimens having been taken.

CRYPTOMYA. Conrad.

114. Cryptomya Californica, Conrad, sp.

Sphænia Californica, Conr., Journ. Acad. Nat. Sci. Phila., vol. vii., pt. 2, p. 234, pl. xvii., fig. 11 (1837).

A very common shell in this province. It is found on muddy shores between tide marks.

MYA. Linne.

115. Mya truncata, Linne.

Syst. Nat., ed. xii., vol. i., pt. 2, p. 1112, no. 26 (1767).

This common European shell is generally distributed throughout the province. It prefers a muddy rather than a sandy shore and is not confined to the beach but is often found in deep water. It is a common fossil in the Boulder Clay.

Mya præcisa, Gould described from Puget Sound, is said by Carpenter to be a synonym of this species, but other authors refer it to *M. arenaria*. Gould's description would answer well for a young specimen of the latter, the original figure I have not been able to see.

116. Mya arenaria, Linne.

Syst. Nat., ed. xii., vol. i., pt. 2, p. 1112, no. 27 (1767).

This species is a puzzle to me. If it is the *M. præcisa* of Gould, or if as Dr. Newcombe asserts it is a frequent fossil in the Boulder Clay it must of course be considered a native of the province. On the other hand, although I had searched the beaches near Victoria for several years previously, I never found a specimen alive or dead until 1888, in which year I dredged a few specimens of the fry in Departure Bay.

On my return to Victoria in 1890, after an absence of two years, I found *M. arenaria* in thousands in the very spots that I had searched over and over again in previous years and in which it could hardly have existed without my finding it.

So that whether *M. arenaria* is a native or not, I am fully persuaded that the thousands of specimens now living in every sandy shore from Victoria to the northern extremity of Vancouver Island are descendants of specimens introduced within the last few years. There seems to be pretty good evidence that *M. arenaria* was introduced near San Francisco with oysters from Eastern America (for as is well known *M. arenaria* is a very common Atlantic shell), and has multiplied prodigiously, and possibly it has spread up the coast until our province was reached some four or five years ago.

SAXICAVA, Bellevue.

117. Saxicava rugosa, Linne, sp.

Mytilus rugosus, Linne, Syst. Nat., ed. xii., vol. i., pt. 2, p. 1156, no. 249 (1767).
Mya arctica, Linne, op. cit., p. 1113, no. 32 (1767).
Solen minutus, Linne, op. cit., p. 1115, no. 42 (1767).
Mytilus pholadis, Linne, Mant. Plant., p. 548 (1771).

Arctica is the earliest specific name for this shell, but it was applied by Linne to a *variety* while the name *rugosus* was given to the typical rock-boring form. *Pholadis*, a still later name, was given to another variety, which appears to be our commonest form, and this name is the one generally used in recent west coast lists.

This shell is very widely distributed and common in this province, as throughout the world, occurring sometimes nestling at roots of seaweed, sometimes attached by a byssus to the rocks in tide pools and sometimes in the burrows of *Penitella*.

My two finest specimens have been taken in the last named station and measure respectively 55 x 25 x 25 and 48 x 25 x 25 mm. A narrow specimen measures 45 x 14 x 16 mm. These all belong to the variety that has the shell gaping widely in front and to which Jeffreys (Brit. Conch., vol. iii., p. 82) restricts the name *pholadis*.

PANOPÆA, Menard.

118. Panopæa Norvegica, Spengler, sp.

Mya Norvegica, Speng., Skrivt. Nat. Selsk., vol. iii., p. 46, pl. ii., fig. 18 (1793).

This is a rare species both in Europe and in America. In our province it is only known from small dead shells which have been dredged near Victoria by Dr. Newcombe and also by myself.

119. Panopæa generosa, Gould.

Proc. Bost. Soc. Nat. Hist., vol. iii., p. 215, (May 1850); and U. S. Expl. Exped., Mollusca, p. 385, fig. 507-507b (1852).

This large species lives at a considerable depth (more than two feet) in the sand, and consequently is not easily obtained. Moreover it does not appear to be at all common on our coasts. Dead shells have been dredged at Victoria and Comox by Dr. Newcombe and lately that gentleman and Mr. Spreadborough discovered living specimens at Clayoquot Sound. I believe that this species is more abundant in Puget Sound. It also occurs on the Californian coasts.

NETTASTOMELLA, Carpenter.

120. Nettastomella Darwinii, Sowerby, sp.

Pholas Darwinii, Sby.

One specimen was obtained at Vancouver Island by Mr. Lord. The species was originally described as from Chili. It has since been found at Monterey (Rich) and San Diego (Cooper) teste Carpenter.

PENITELLA. Conrad.

121. Penitella penita, Conrad, sp.

Pholas penita, Conr., Jour. Acad. Nat. Sci. Phila., vol. vii., pt. 2, p. 237, pl. xviii, fig. 7 (1837).

Common all round the coast of Vancouver Island, perforating soft rocks between tides. At Vesuvius Bay, Salt Spring Island, I have found very fine specimens measuring more than 3½ inches in length and nearly 6 inches in circumference at the umbones. This species is said by Dall[1] to be found at Bering Island with *Saxicava rugosa* "living in large masses of *Melobesia*, which form accumulations almost like coral on the exposed coasts."

122. Penitella ovoidea, Gould, sp.

Pholas ovoidea, Gould, Proc. Bost. Soc. Nat. Hist., vol. iv., p. 87 (Nov., 1851).

I am not sure that I know this species. It was described from Monterey, and Carpenter in his "Supplementary Report" gives it a southern range. Specimens that I have received from California under this name are indistinguishable from *P. penita*. Mr. Whiteaves in his account of Mr. Richardson's collections says that he collected four living specimens of *P. penita* and four of *P. ovoidea*, near Victoria in 1875. He further says that *penita* has "Siphonal tube wrinkled but not tuberculated" while *ovoidea* has "Siphonal tube tuberculated externally, especially near the middle."

Through the kindness of Mr. Whiteaves one of Richardson's specimens is in my cabinet, but though it manifestly differs from typical *penita* it does not to my mind accord sufficiently well with Gould's description of *ovoidea*.

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[1] "Report on the Mollusca of the Commander Islands and Bering Sea, collected by Leonhard Stejneger in 1882-3." Proc. U. S. Nat. Mus., vol. vii. (1884), p. 348-349.

In the same locality with *P. penita* were found: *Mytilus edulis*, *Modiola modiola*, *Cardium blandum*, *Serripes Groenlandicus*, *Tapes staminea*, *Macoma Middendorffi*, *Mactra falcata*, *Siliqua patula*, *Saxicava rugosa*, *Pholas crispata*, *Buccinum Mærchianum*, *Chrysodomus liratus*, *Purpura lima*, *Littorina sitkana*, *Lacuna vincta*, *Acmæa pelta*, *Margarita helicina*, and *Cryptochiton Stelleri*.

Dr. Newcombe informs me that he has lately found on the beach near Victoria a shell which Dr. Dall has determined for him as *Penitella tubifera*, Sby. Tryon has also described *Penitella curvata*, from the Straits of Fuca (Amer. Jour. Conch. vol. i., p. 40, pl. ii., fig. 6, 7 and 8 (1865).

ZIRPHÆA, Leach.

123. ZIRPHÆA CRISPATA, Linne, sp.

Pholas crispata, Linn., Syst. Nat., ed. xii., vol. i., pt. 2. p. 1111, no. 25 (1767).

This species is not uncommon in Europe and on the eastern coasts of America. In the Pacific it is recorded by Carpenter as from Puget Sound (two specimens Dr. Kennerley) and with a query from Swan's collection.

Dr. Dawson found a large worn right valve on the beach north of Cumshewa Harbour, Queen Charlotte Islands, and I found some fine specimens living in sand between tides at Cordova Bay ten years ago, but have never had an opportunity of revisiting that locality and have not been fortunate enough to find specimens anywhere else.

XYLOPHAGA, Turton.

124. XYLOPHAGA DORSALIS, Turton, sp.

Teredo dorsalis, Turton, Conch. Dict., p. 185.

Specimens taken by myself in 1888 were I believe the first noted on the Pacific coast of America. They were found living in small pieces of drift wood dredged up in Departure Bay. The shell has since been found near Victoria by Dr. Newcombe.

XYLOTRYA, Leach.

125. XYLOTRYA BIPINNATA, Turton, sp.

Teredo bipennata, Turton, Conch. Dict.

126. XYLOTRYA FIMBRIATA, Jeffreys.

Teredo fimbriata, Jeff., Ann. Mag. Nat. Hist., 1860, p. 126.

Both these *Teredines* are said by Carpenter to occur at Vancouver Island. All the specimens I have taken so far seem to belong to the first named species, but I must admit that I have given but little attention to these shells and have collected very few specimens.

Dr. Newcombe in his catalogue records *X. fimbriata* from Victoria

on my authority, but I am afraid this is a mistake, for which I must apologize, as a re-examination shows that all my specimens are *X. bipinnata*.

SCAPHOPODA.

DENTALIUM, Linne.

127. Dentalium indianorum, Carpenter.

Rept. Brit. Assoc., 1863, p. 648 (August, 1864) = *pretiosum*, Nuttall.

Common in our northern waters though not yet met with on the eastern or southern coasts of Vancouver Island.

Shells of this species were formerly of considerable value as a medium of exchange among the Indians and they are still extensively used by the aborigines for ornamental purposes. Jeffreys supposed this species to be equivalent to the British *D. entale*, Linne.

128. Dentalium rectius, Carpenter.

Rept. Brit. Assoc., 1863, p. 648 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 59.

This species was first found (dead) in Puget Sound by Kennerley, and Carpenter speaks of it as being "very rare." The only British Columbian specimen I have seen or heard of, is the one in the Geological Museum at Ottawa, which was dredged alive by Mr. Richardson, near Victoria in 1875.

CADULUS, Philippi.

129. Cadulus aberrans. Whiteaves.

Trans. Roy. Soc. Canada, 1886, vol. iv., sect. iv., p. 124, fig. 2.

This species was one of Dr. Dawson's discoveries. It was dredged by him in 1885, very abundantly in Forward Inlet, Quatsino Sound, in 10-20 fathoms *mud*.

The shell has not so far as I know been found anywhere else in British Columbia, but Mr. Whiteaves has a note that it has been dredged near the Catalina Islands by Dr. J. G. Cooper.

GASTEROPODA.

PTEROPODA.

It would perhaps have been better to have omitted all mention of this order as no species have been collected by recent observers, but I did not like to omit any name that has had a place on Carpenter's list

and he gives one species of *Pteropoda* as having been collected by Lord in British Columbian waters.

It is a species of wide distribution in the Atlantic as well as the Pacific Ocean and is figured by Dall in pl. lxvi., fig. 113, of Bulletin 37, U. S. Nat. Mus., previously referred to.

Carpenter writes [130] "*Cavolina telemus*, Linne = *Hyalæa tridentata*, Forsk non Lamarck." Dall gives it as *Cavolina tridentata* Forsk. I am not in a position to form any opinion as to whether Linne's older name has reference to the shell in question or not.

OPISTHOBRANCHIATA.

RICTAXIS, Dall.

131. Rictaxis punctocœlata, Carpenter, sp.

Tornatella punctocœlata, Cpr., Rept. Brit. Assoc., 1863, p. 646 (Augt., 1864); and Journ. de Conch., vol. xii., p. 139 (April, 1865).

A southern shell only recently detected in our waters. The first native specimens I have seen were dredged by Professor Macoun and myself in Departure Bay last year. I have since heard that large specimens have been found dead on the beach at the north end of Vancouver Island, by Mr. Anderson, and that others have been collected on the east side of Denman Island by Mr. Harvey.

TORNATINA, A. Adams.

132. Tornatina culcitella, Gould, sp.

Bulla (Akera) culcitella, Gould, Bost. Journ. Nat. Hist., vol. vi., no. 3, p. 377, pl. xiv., fig. 8 (Oct., 1853).
+ *Bulla (Tornatina) cerealis*, Gould, op. cit. p. 378, pl. xiv., fig. 9 (Oct., 1853).
Bullina (Tornatina) eximia, Baird, Proc. Zool. Soc. London, 1863, p. 67, pl. i., fig. 5.

This is the commonest of our three Tornatinas. It seems to abound in about ten fathoms wherever the bottom is sandy. Dr. Dawson obtained it at the Queen Charlotte Islands and in various localities in the Straits of Georgia, Discovery Passage and Queen Charlotte and Quatsino Sounds. Dr. Newcombe has dredged it in Ganges Harbour, Clayoquot Sound and at Comox, Professor Macoun at Sooke—and I have myself found it at Victoria and Departure Bay.

133. Tornatina inculta, Gould.

Bulla (Tornatina) inculta, Gould, Pac. R.R. Rept., vol. v., p. 334, pl. xi., fig. 27-28 (1856).
Tornatina inculta, Gould and Carpenter, Proc. Zool. Soc. London, 1856, p. 203.

The only specimens of this species that have been taken up to the present time in British Columbia were obtained by myself by dredging in Departure Bay in 1888.

134. Tornatina harpa, Dall.

Amer. Jour. Conch., vol. vii., p. 136, pl. xv., fig. 11 (November, 1871).

A single specimen of this little shell was dredged, in about five fathoms, in Clayoquot Sound last September by Dr. Newcombe. It was determined for him by Dr. Dall. *Tornatina harpa* was described from Monterey, California, "Three specimens adhering to the tentaculæ of Actinias."

CYLICHNA, Loven.

135. Cylichna cylindracea, Pennant, sp.

Bulla cylindracea, Penn., Brit. Zool., vol. iv., p. 117, pl. lxx., fig. 85.
var. *attonsa*, Cpr., Rept. Brit. Assoc., 1863, p. 647 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 58.
= *C. propinqua*, E. A. Smith, Ann. Mag. Nat. Hist., series 4, vol. ix., p. 351.

This shell is not very common. It has been recorded from the Straits of Georgia, Quatsino Sound and the Queen Charlotte Islands, by Mr. Whiteaves, under the name *C. alba*. Dr. Newcombe has dredged it at Comox and Clayoquot Sound, Prof. Macoun at Sooke, and I have dredged it in Departure Bay.

I have seen the type of *C. propinqua* which is in the Natural History Museum, South Kensington. It is a fine specimen of *C. attonsa*.

DIAPHANA, Brown.

136. Diaphana pellucida, Brown.[1]

Ill. Recent Conch., pl. xix., fig. 10, 41 (1827).
= *Bulla hyalina*, Turton, Mag. Nat. Hist., vol. vii., p. 353 (1834).
= *Bulla debilis*, Gould, Invert. Mass., ed. i., p. 164, fig. 95 (1841).
etc., etc.

Five immature shells were found by me among roots of kelp washed ashore near Clover Point, Victoria, in 1888. Dr. Dall, to whom these were submitted, referred them doubtfully to *debilis*, Gould.

Lately I have seen a full-grown specimen taken at Sooke by Prof. Macoun, and I find it to accord exactly with the description of *Utriculus hyalina* in Jeffreys's "British Conchology," and also with the figure of Gould's *Bulla debilis* in the "Invertebrata of Massachusetts."

D. pellucida is not a very common species in European seas. Jeffreys has noted about thirty localities for it on the British coasts, and quotes it also from Norway, Sweden, Iceland and Greenland, and from Madeira and the Canary Islands.

As *debilis* it is on record from Eastern American coasts and it is now recorded I think for the first time from the Pacific Ocean.

[1] I adopt the synonymy of this species as given by Verrill in Proc. U. S. Nat. Mus., 1880, p. 382.

HAMINEA, Leach.

137. HAMINEA HYDATIS, Linne, sp.

Bulla hydatis, Linne, Syst. Nat., ed. xii., vol. i., pt. 2, p. 1183, no. 377 (1767).
var. vesicula, Gould.
Bulla (Haminea) vesicula, Gould, Pac. R. R. Rept., vol. v., p. 334, pl. xi., fig. 29 (1856).
Haminea vesicula, Gould and Carpenter, Proc. Zool. Soc. London, 1856, p. 203.

Very common indeed among sea grass on sandy shores near low water mark.

NUDIBRANCHIATA.

No attempt is made to enumerate the species of this order inhabiting this province as they have not been systematically collected or studied. Carpenter mentions one species, the common *Chiorœra leonina*, Gould, from Puget Sound and Whiteaves gives this and one other *Dendronotus purpureus*, Bergh, as collected by Dr. Dawson in 1885.

As our species are numerous and many of them large and conspicuous it is hoped that before long some one may be induced to undertake their collection and determination.

PULMONATA.

In order to make this catalogue more complete a list is here given of our British Columbian land and fresh water Pulmonata.

138. SELENITES VANCOUVERENSIS, Lea, sp.
139. SELENITES SPORTELLA, Gould, sp.
140. LIMAX AGRESTIS, Linne.
141. LIMAX HYPERBOREUS, Westerlund.
142. VITRINA PFEIFFERI, Newcomb.
143. HYALINA ARBOREA, Say, sp.
144. HYALINA RADIATULA, Alder, sp.
145. HYALINA MILIUM, Morse, sp.
146. HYALINA BINNEYANA, Morse.
147. CONULUS FULVUS, Draparnaud, sp.
148. PRISTILOMA LANSINGI, Bland, sp.
149. PRISTILOMA STEARNSII, Bland, sp.
150. ARIOLIMAX COLUMBIANUS, Gould, sp.
151. PROPHYSAON HEMPHILLI, Bland & Binney.
152. PROPHYSAON PACIFICUM, Cockerell.
153. PATULA STRIATELLA, Anthony, sp.
154. PATULA ASTERISCA, Morse.
155. PUNCTUM MINUTISSIMUM, Lea, sp.
156. PUNCTUM CONSPECTUM, Bland, sp.

157. Lysinoe Townsendiana, Lea, sp.
158. Mesodon Columbianus, Lea, sp.
159. Mesodon devius, Gould, sp.
160. Stenotrema germanum, Gould, sp
161. Pupa corpulenta, Morse, sp.
162. Pupa simplex, Gould.
163. Vertigo ovata, Say.
164. Ferussacia subcylindrica, Linne, sp.
165. Succinea Hawkinsii, Baird.
166. Succinea Nuttalliana, Lea.
167. Succinea Oregonensis, Lea.
168. Succinea rusticana, Gould.
169. Onchidium Carpenteri, W. G. Binney.
170. Onchidella borealis, Dall.
171. Carychium exiguum, Say, sp.
172. Limnæa stagnalis, Linne, sp.
173. Limnæa ampla, Mighels.
174. Limnæa palustris, Müller.
175. Limnæa Adelinæ, Tryon.
176. Limnæa humilis, Say.
177. Limnæa Nuttalliana, Lea.
178. Physa Lordi, Baird.
179. Physa gyrina, Say.
180. Physa ampullacea, Gould.
181. Physa heterostropha, Say, sp.
182. Bulinus hypnorum, Linne, sp.
183. Planorbis ammon, Gould.
184. Planorbis trivolvis, Say.
185. Planorbis bicarinatus, Say.
186. Planorbis opercularis, Gould.
187. Planorbis exacutus, Say.
188. Planorbis parvus, Say.
189. Ancylus caurinus, Cooper.
190. Ancylus fragilis, Tryon.
191. Ancylus kootaniensis, Baird.

SIPHONARIA, Gray.

192. Siphonaria Thersites, Carpenter.

Rept. Brit. Assoc., 1863, p. 647 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xiv., p. 425 (Dec., 1864).

Common on all our coasts near high water mark on rocks and sea-weed. Dr. Dall writes ("Remarks on the genus *Siphonaria*," Amer. Journ. Conch., vol. vi. (1870), p. 30, etc):

"This species having been obtained in latitude 57° N. is probably the most northern representative of the genus."

CTENOBRANCHIATA.

SURCULA, H. & A. Adams.

193. Surcula perversa, Gabb.

Proc. Cal. Acad. Nat. Sci., 1865.

With the exception of two specimens dredged by Dr. Dawson in Queen Charlotte Sound all the native specimens of this shell that I have seen have been taken near Victoria. In this locality it is not rare, having been dredged in 10 to 20 fathoms, mud, by Richardson, Newcombe, myself and others.

Adult specimens are usually much eroded.

DRILLIA, Gray.

194. Drillia incisa, Carpenter.

Rept. Brit. Assoc., 1863, p. 657 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 62.

Not common. Virago Sound (Dawson), Clayoquot Sound (Newcombe). Dead specimens at Vesuvius Bay, Salt Spring Island, Saanich and Victoria.

195. Drillia cancellata, Carpenter.

Rept. Brit. Assoc., 1863, p. 658 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 63.

A rare species. Dr. Kennerley obtained a single specimen in Puget Sound, and a few have been dredged at Victoria and Departure Bay by myself and others, and at Comox by Dr. Newcombe. This species was not represented in any of Dr. Dawson's collections.

BELA, Gray.

Seven species of this genus are on our list, as follows:

196. Bela fidicula, Gould, sp.

Fusus fidicula, Gould, Proc. Bost. Soc. Nat. Hist., vol. iii., p. 141 (May, 1849); and U. S. Expl. Exped., Mollusca, p. 233, figs. 284-284*b* (1852).

197. Bela excurvata, Carpenter.

Rept. Brit. Assoc., 1863, p. 658 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 63.

198. Bela Trevelyana, Turton, sp.

Pleurotoma Trevellianum, Turton, Mag. Nat. Hist., vol. vii., p. 351 (1834).

199. Bela exarata, Möller, sp.

Defrancia exarata, Moller, Index Moll. Grœl., p. 12 (1842).

200. Bela crebricostata, Carpenter, sp.

Mangilia crebricostata, Cpr., Rept. Brit. Assoc., 1863, p. 658 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xv., p. 29 (January, 1865).

201. Bela tabulata, Carpenter, Sp.

? *Mangilia tabulata*, Cpr., Rept. Brit. Assoc., 1863, p. 658 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xv., p. 29 (January, 1865).

202. Bela violacea, Mighels and Adams, sp.

Pleurotoma violacea, M. and Ad., Proc. Bost. Soc. Nat. Hist., vol. i., p. 50 (November, 1841); and Bost. Jour. Nat. Hist., vol. iv., no. i., p. 51, pl. iv., fig. 21 (January, 1842).

The first named, *B. fidicula*, is the common species with us, and represents the European *B. turricula*, Montagu. It is reported from the Queen Charlotte Islands, Queen Charlotte Sound and Johnston Straits (Dawson), and several Vancouver Island localities.

The next three species are very nearly allied to each other.

B. excurvata was described from a single specimen from Puget Sound (Kennerley).

B. Trevelyana is added, by Mr. Whiteaves, on the strength of one dead shell dredged in Virago Sound by Dr. Dawson.

B. exarata is the name given by Dr. Dall to shells from Comox and Victoria sent to him by Dr. Newcombe for determination.

It seems to be just possible that our British Columbian specimens, thus variously determined, may all belong to a single species, namely that intended by Carpenter in his description of *B. excurvata*, which is said to be "like Trevelliana" and which may or may not be equivalent to Möller's earlier *B. exarata*.

B. crebricostata (specimens identified by Dr. Dall) is rare at Victoria and we have not found it elsewhere. The type specimen was collected by Swan.

B. tabulata (specimen also identified by Dall) is from Victoria, but is also on record from Queen Charlotte Sound (two specimens). Mr. Whiteaves, however, in writing of these specimens remarks "perhaps a

variety of *fidicula*" which makes me doubt whether he had genuine *tabulata* before him.

Lastly there is *B. violacea* of which a single living specimen was taken, according to Whiteaves, in Alert Bay by Dr. Dawson.

The two last named species approach in form the next genus and would not be likely to be confused with typical Belas.

MANGILIA. Risso.

We have four species :

203. Mangilia sculpturata, Dall, sp.

Bela sculpturata, Dall, Proc. U. S. Nat. Mus., vol. ix. (1886); p. 299, pl. iv, fig. 7.

204. Mangilia angulata, Carpenter.

Rept. Brit. Assoc., 1863, p. 658 (Augt., 1864); and Ann. Mag. Nat. Hist., series 3, vol. xv., p. 394 (May, 1865).

205. Mangilia interfossa, Carpenter.

Rept. Brit. Assoc., 1863, p. 658 (Augt., 1864); and Ann. Mag. Nat. Hist., series 3, vol. xv., p. 29 (Jan. 1865).

206. Mangilia levidensis, Carpenter.

Rept. Brit. Assoc., 1863, p. 658 (Augt., 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 63.
= *funebrale*, Dall, Amer. Journ. Conch., vol. vii., p. 100 (1871), teste Dall, Proc. U. S. Nat. Mus., vol. ix. (1886), p. 299.

The first three of these species are closely related. *M. interfossa* and *angulata* have not been detected here since Carpenter's time but *sculpturata* is common in nearly all the Vancouver Island localities I have examined. It was taken also at the Queen Charlotte Islands by Dr. Dawson. *M. sculpturata* is a rather variable shell and Dr. Dall tells me that northern specimens lack the colour band that is so conspicuous in our shells.

M. levidensis is a beautiful shell quite distinct from and considerably larger than the three last mentioned. It has only been found, recently, by Dr. Newcombe and myself, at Comox and Victoria. The type specimens of *levidensis* and *angulata* were from Puget Sound and of *interfossa* from Neeah Bay.

Dr. Newcombe has a shell apparently of the present genus which Dr. Dall has informed him is probably of an undescribed species. Still another shell which may belong here was described by Mr. E. A. Smith as *Pleurotoma Vancouverensis* (Ann. Mag. Nat. Hist., series 5, vol. vi., p. 286 (1880), but I have not seen the description and do not know the species.

CANCELLARIA, Lamarck.

207. Cancellaria modesta, Carpenter.

Rept. Brit. Assoc., 1863, p. 660 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xv., p. 32 (January, 1865).

208. Cancellaria Unalashkensis, Dall.

Cancellaria (Trigonostoma) Unalashkensis, Dall, Proc. Cal. Acad. Sci., vol. v., p. 58, pl. ii., fig. 1 (1873).

209. Cancellaria circumcincta, Dall.

Cancellaria (Trigonostoma) circumcincta, Dall, Proc. Cal. Acad. Sci., vol. v., p. 58, pl. ii., fig. 2 (1873).

Here again we have three species very nearly allied, but probably distinct.

C. modesta was described from Swan's collection, and has not been since noticed in this province.

C. Unalashkensis and *circumcincta* were described and figured by Dall,[1] the first from Unalashka, where, he says, *modesta* also was found, and the latter from Popoff Strait, Shumagin Islands.

C. Unalashkensis has since been found at Victoria and Clayoquot Sound by Dr. Newcombe, and *circumcincta* has been dredged by Dawson at Forward Bay, Freshwater Bay and Cullen Harbour, and by myself in Departure Bay, near Nanaimo.

ADMETE, Möller.

210. Admete Couthouyi, Jay, sp.

Cancellaria Couthouyi, Jay, Catalogue, ed. 3, pt. 77 (1839).
= *C. buccinoides*, Couthouy, 1838 *(preoccupied)*,
= *viridula*, Auct., non O. Fab.

This Atlantic species was added to our list by Whiteaves, who records six specimens as having been taken at various points in Queen Charlotte Sound by Dr. Dawson. Dr. Newcombe has since taken a specimen near Victoria. Dr. Dall has pointed out (Proc. U. S. Nat. Mus., ix., 1886, p. 298) that this species is not the *Tritonium viridulum* of O. Fabricius, although it has long gone under that name.

OLIVELLA, Swainson.

211. Olivella biplicata, Sowerby, sp.

Oliva biplicata, G. B. Sby., Tank. Cat., app. xxxiii., no. 2332 (1825).

Very abundant on the north and west coasts of Vancouver Island

[1] "Preliminary Descriptions of New Species of Mollusca from the Coast of Alaska, with notes on some rare forms," Proc. Cal. Acad. Sci., vol. v., pp. 57-62, pl. ii., April, 1873).

in sand between tides, and to a depth of a few fathoms below low-water mark.

212. OLIVELLA BÆTICA, Carpenter.

Rept. Brit. Assoc., 1863, p. 661 (August, 1864).

Very common in shallow water on sandy bottoms. Queen Charlotte Islands, Queen Charlotte Sound and other localities (Dawson); Departure Bay, abundant (G. W. Taylor); Victoria, rare (Newcombe); Clayoquot Sound (Newcombe); Comox (Macoun).

VOLUTELLA, Swainson.

213. VOLUTELLA PYRIFORMIS, Carpenter.

Rept. Brit. Assoc., 1863, p. 661 (August, 1864); and Journ. de Conch., vol. xii., p. 148 (April, 1865).

A common shell usually found under stones, or under seaweed on rocks, near low water mark, but sometimes dredged from deeper water. It occurs from Victoria to the Queen Charlotte Islands. During life the animal is of a bright yellow colour.

MITROMORPHA, A. Adams.

214. MITROMORPHA FILOSA, Carpenter.

? *Daphnella filosa*, Cpr., Rept. Brit. Assoc., 1863, p. 658 (August, 1864).
Mitromorpha filosa, Cpr., Ann. Mag. Nat. Hist., series 3, vol. xv., p. 182 (March, 1865).

Described from Sta. Barbara and not very rare at several other points on the Californian coast. The only British Columbian specimens I have heard of were three, dredged by Dr. Dawson at the mouth of Cumshewa Harbour in 20 fathoms of water.

215. MITROMORPHA EFFUSA, Carpenter.

? *Daphnella effusa*, Cpr., Rept. Brit. Assoc., 1863, p. 658 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xv., p. 29 (January, 1865).

Described from "one broken specimen, Neeah Bay, Swan," a rather slender title I am afraid, to a place on our list.

BUCCINUM, Linne.

216. BUCCINUM POLARE, Gray.

Buccinum polaris, Gray, Zool. Voy. Blossom, p. 128 (1839), var. ? *percrassum*, Dall.

Buccinum percrassum though now thought, by some conchologists, to be a distinct species was described as a variety of *S. polare* and it was

under this name (though most unfortunately as var. *compactum* instead of *percrassum*) that our first British Columbian specimens were recorded.

Under this name (*compactum*) will be found a note of two specimens, dead, found by Mr. Richardson on the beach at Victoria in 1875 and of one specimen, also dead, that was taken by Dr. Dawson off False Head, Vancouver Island, ten years later.

Since that date Dr. Newcombe has dredged three dead specimens off Macauley's point near Victoria, and both the doctor and myself have found fossil specimens in the Boulder Clay.

B. percrassum is not uncommon, living, to the north of us.

217. Buccinum cyaneum, Bruguière.

var. Mœrchianum, Fischer.

Volutoharpa mærchiana, Fischer, Journ. de Conch., vol. vii., p. 299 (March, 1859).

In 1890 I received from Mr. E. S. Wilkinson, four specimens of this species, that had been picked up by him on the beach at Alert Bay, Vancouver Island. One of the specimens was alive when found, the other three dead. Dr. Newcombe has since found a dead specimen on the shore at Victoria.

My shells were kindly determined for me by Dr. Dall.

CHRYSODOMUS, Swainson.

218. Chrysodomus fornicatus, O. Fabricius, sp.

Tritonium fornicatum, O. Fab., Fauna Grœnl., p. 399 (1780).

The first specimens of this species found here were two dead ones dredged by myself outside Victoria Harbour in 1886. Dr. Newcombe has since dredged a couple of living specimens in the same locality. When fresh the shell is of a dark purplish brown colour, with an olivaceous epidermis.

219. Chrysodomus liratus, Martyn, sp.

Buccinum liratum, Martyn, Univ. Conch., vol. ii., no. 43, pl. xiii. and xiv., fig. 1 (1784).
= *decemcostatus*, Midd., not Say.
= *Middendorffi*, Cooper.

Five living specimens of this species were dredged by Dr. Dawson, in 1885, at Freshwater Bay, near Malcolm Island, and off False Head, all of which localities are in Queen Charlotte Sound.

I have not seen living specimens from any more southerly localities, but Dr. Newcombe has dredged dead specimens near Victoria.

220. Chrysodomus Kennicottii, Dall.

Buccinum Kennicottii, Dall, Amer. Journ. Conch., vol. vii., p. 108, pl. xv., fig. 1 (November, 1871).
Chrysodomus Kennicottii, Dall, Proc. Cal. Acad. Sci., vol. iv., p. 271 (October, 1872).

A single dead specimen was dredged by me in the same place and at the same time as the specimens of *C. fornicatus* mentioned above. The species was described by Dall from Unalashka.

221. Chrysodomus tabulatus, Baird.

Proc. Zool. Soc. London, 1863, p. 66, pl. i., fig. 1.

This is our most abundant species of *Chrysodomus*, though at present we have only found it in the southern parts of the province.

It is dredged quite commonly near Victoria, in 10–20 fathoms.

The dead shells, usually tenanted by large hermit crabs, often contain also beautiful specimens of *Crepidula navicelloides*.

222. Chrysodomus Harfordi, Stearns.

Fusus (? Chrysodomus) Harfordi, Stearns, Proc. Cal. Acad. Sci., vol. v., p. 79 (1873).

The type specimens of *C. Harfordi* were found in Mendocino County, California (Harford) and the Farallones (Watkins). The single example found in British Columbia was taken alive by Dr. Dawson on rocks at low water in Houston-Stewart Channel, Queen Charlotte Islands, and is now in the museum of the Geological Survey at Ottawa. For an extended description of this species, see Dall "On the California species of Fusus," in Proc. Cal. Acad. Sci., vol. vii., 1877.

223. Chrysodomus rectirostris, Carpenter.

Rept. Brit. Assoc., 1863, p. 664 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 64.
=*Sipho angustus*, E. A. Smith, Ann. Mag. Nat. Hist., series 5, vol. vi., p. 287 (1880).

This species was described by Carpenter from a single specimen taken by Kennerley in Puget Sound. The type, which is preserved in the United States National Museum, was not in good condition, and Carpenter's original description will hardly apply to perfect specimens. Hence the species has been redescribed by Mr. E. A. Smith as *Sipho angustus*.

It is not a common shell. Richardson dredged three living specimens near Victoria in 1875, Dr. Newcombe has taken one or more in the same place, and I have a single dead shell also taken near Victoria.

My specimen was compared with Carpenter's type by Dr. Dall and with the type of *angustus* by Mr. E. A. Smith and myself, so that there can be no doubt as to the synonymy.

224. CHRYSODOMUS PHŒNICEUS, Dall.

Proc. U. S. Nat. Mus., vol. xiv., p. 187 (1891).

This species was taken by the naturalists of the U. S. Fish Commission steamer Albatross, near Goletas Channel, Queen Charlotte Sound.

225. CHRYSODOMUS VERKRUZENI, Kobelt.

One large dead shell belonging to this species was dredged by Dr. Dawson off False Head, Vancouver Island, in about thirty fathoms, this being, according to Mr. Whiteaves, the most southerly locality yet reported for the species.

MOHNIA, Friele.

226. MOHNIA FRIELEI, Dall.

Proc. U. S. Nat. Mus., vol. xiv., p. 187 (1891).

Off north coast of Vancouver Island, 1888 (Albatross).

EUTHRIA, Gray.

227. EUTHRIA DIRA, Reeve, sp.

Buccinum dirum, Rve., Conch. Icon., Mon. of Bucc., fig. 92 (December, 1846).
= *Fusus incisus*, Gould (1849).
= *Tritonium* (*Fusus*) *sitchense*, Midd. (1849).

A common littoral species, occurring in all localities examined within the province, and ranging northward to Alaska and southward to Monterey.

Specimens of *Crepidula adunca* are commonly found attached to the shells of this species.

NASSA, Lamarck.

228. NASSA FOSSATA, Gould, sp.

Buccinum fossatum, Gould, Proc. Bost. Soc. Nat. Hist., vol. iii., p. 152 (Jan., 1850); and U. S. Expl. Exped., Mollusca, p. 254, fig. 321, 321a (1852).

This species occurs with us only on the west coast of Vancouver Island; it is found from extreme low water to twenty fathoms.

It is a not uncommon Californian shell.

229. NASSA MENDICA, Gould.

Proc. Bost. Soc. Nat. Hist., vol. iii., p. 155 (January, 1850); and U. S. Expl. Exped., Mollusca, p. 263, figs. 331, 331*a* (1852).

Very abundant and variable. It has been dredged, wherever dredging has been carried on, from the Queen Charlotte Islands to Victoria. A

variety that was named *N. Gibbsii* by W. Cooper is the common form between tides in Esquimalt harbour.

ASTYRIS, H. and A. Adams.

230. Astyris tuberosa, Carpenter, sp.

Amycla tuberosa, Cpr., Rept. Brit. Assoc., 1863, p. 662 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xv., p. 398 (May, 1865).

Dr. Carpenter, on p. 628 of his "Supplementary Report," writes of the present species as "rare" among Swan's Puget Sound and Vancouver Island shells, and on page 662 of the same report he places it in the Vancouver column.

In his description of this species, however, in the Annals and Magazine of Natural History, he makes no mention of any locality for the shell north of Monterey. Perhaps the name should be struck off our lists, for the species does not seem to have been found in the province since Carpenter's time.

231. Astyris carinata, Hinds, sp.

Columbella carinata, Hinds, Zool. Voy. Sulph., vol. ii., p. 39, pl. x., figs. 15-16 (1844).
= *C. gausapata*, Gould, 1850.
= *C. Hindsii*, Reeve.

C. gausapata is the northern form of *carinata*. The species is common, and is found between tides or just below low-water mark all through the province. Dr. Newcombe, in his Catalogue, confuses this species with the next, which is, as far as I can see, undoubtedly distinct.

NITIDELLA, Swainson.

232. Nitidella Gouldii, Gould and Cpr.

Proc. Zool. Soc., London, 1856, p. 208.

This is a much larger shell than the last named, and is further distinguished by the possession of a thick and rough epidermis. It is generally obtained by dredging in ten to twenty fathoms, and has been taken by myself and others abundantly at Victoria and Departure Bay; also on the west coast of Vancouver Island, by Dr. Newcombe, and in many northern localities by Dr. Dawson.

Tryon included this species in the synonymy of *Astyris carinata*, and Dr. Dall has also expressed the opinion that they belong together. I still think, however, that the species are distinct, as I have seen no approach to an intermediate specimen.

Mr. E. A. Smith has redescribed this shell under the name *Colum-*

bella (*Nitidella*) *Dalli*.[1] I have compared some of our shells with Smith's type and find no difference whatsoever.

AMPHISSA, H. and A. Adams.

233. Amphissa corrugata, Reeve, sp.

Buccinum corrugatum, Rve., Conch. Icon., Mon. of Bucc., no. 110 (February, 1847).

Common both between tides and in deeper water.

The littoral specimens are usually much overgrown with Polyzoa. There is a variety that is smaller than the ordinary form, and which in some respects approaches *A. versicolor*, Dall, and *A. undata*, Cpr. It is, however, I believe, only a variety of *A. corrugata* The specimens recorded by Mr. Whiteaves as *A. versicolor*, from Houston-Stewart Channel and Cumshewa Harbour (Queen Charlotte Islands), should most probably be referred to this form.

TROPHON, De Montfort.

234. Trophon multicostatus, Eschscholtz, sp.

Murex multicostatus, Esch., Zool. Atlas, pt. 2, p. 11, pl. ix., fig. 4 (1829).

I have retained for this species its familiar west coast name, though there is little doubt but that our shell is a form of the European *Trophon clathratus*, Linne, sp. (Syst. Nat., ed. xii., vol. i., pt. 1, p. 1223, no. 563, 1767). The species occurs here in two forms, the ordinary one with the interior of the shell white, and a rarer one with the mouth dark chocolate colour. I have seen a specimen of this form in the Natural History Museum, South Kensington, labelled as a distinct species, but Dr. Dall, who has seen one of my specimens, regards it as merely a variety of *T. multicostatus*. This species occurs not uncommonly at Victoria, and it was taken by Dr. Dawson in Queen Charlotte Sound and Johnston Straits, but not at the Queen Charlotte Islands.

235. Trophon Orpheus, Gould, sp.

Fusus Orpheus, Gould, Proc. Bost. Soc. Nat. Hist., vol. iii., p. 142 (May, 1849); and U. S. Expl. Exped., Mollusca, p. 234, fig. 285-285B (1852).

This species, according to Dr. Newcombe, is the most abundant *Trophon* at Victoria. It has also been taken by Dr. Newcombe at Departure Bay, and possibly by Dr. Dawson in Cumshewa Harbour. Mr. Whiteaves gives it from three localities in Queen Charlotte Sound, but he has evidently confused this species with the next, and I believe all the specimens in Dr. Dawson's collections should be included under *T. Stuarti*.

[1] Annals and Magazine of Natural History, series 5, vol. vi., p. 287 (1880).

236. TROPHON STUARTI, E. A. Smith.

Proc. Zool. Soc. London, 1880, p. 481, pl. xlviii., fig. 6.

This is our largest and finest species of *Trophon*. It is perfectly distinct from *T. Orpheus* and very much larger. The type was dredged by Capt. Vidler near Victoria, and passed into the hands of a London dealer, from whom Mr. Smith obtained it.

It is apparently much rarer than *Orpheus*, and has so far only been found at Victoria by Capt. Vidler, Dr. Newcombe and myself, and by Dr. Dawson at the three localities in Queen Charlotte Sound referred to under the preceding species. Dr. Dawson's specimens were three in number and very fine.

237. TROPHON TENUISCULPTUS, Carpenter.

Ann. Mag. Nat. Hist., series 3, vol. xvii., p. 277 (April, 1866).

Not rare, occurring everywhere from Victoria to the Queen Charlotte Islands in 10–30 fathoms.

This species was described by Carpenter as a Pleistocene fossil from Sta. Barbara, California.

238. TROPHON DALLII, Kobelt.

Mon. of Trophon in Mart. Chem. (neu. ausg.)
T. muriciformis, Dall,[1] Proc. Cal. Acad. Sci., vol. vii. (1877).

Dall's name being preoccupied, it was changed by Kobelt as above.

The species was described from Icy Cape and Bering Sea, but has been dredged near Victoria by Richardson, Newcombe and myself. It seems to be very rare, and only a few specimens in all have as yet been obtained.

Trophon Dallii is well figured in plate iv., figure 6, of volume ix., of the Proceedings of United States National Museum.

OCINEBRA, Leach.

239. OCINEBRA LURIDA, Middendorff, sp.

Tritonium (Fusus) luridum, Midd., Bull. Acad. Sci. St. Peters., vol. vii., no. 160, p. 244 (1849); Mal. Ross., pt. 2, p. 150, no. 15, pl. iv., figs. 4 and 5 (1849).
= *Vitularia aspera*, Baird, Proc. Zool. Soc. London, 1863, p. 66, pl. i., fig. 2.

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[1] The paper in which this species was first described is entitled "Preliminary description of new species of Mollusks from the northwest coast of America" (Proc. Cal. Acad. Sci., vol. vii., March, 1877). It contains also the original description of another of our shells, *Kennerlia grandis*.

240. Ocinebra interfossa, Carpenter.

Rept. Brit. Assoc., 1863, p. 663 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 64.

Both the above are common littoral shells, occurring all through the province under stones, near low water mark. Both are subject to considerable variation.

CEROSTOMA, Conrad.

241. Cerostoma foliatum, Martyn, sp.

Purpura foliata, Martyn, Univ. Conch., vol. ii., no. 66, pl. xxiv., fig. 1 (1784).
= *Murex foliatus*, Gmelin.
= *M. monodon*, Esch.,
etc., etc.

At extreme low tide on all our rocky coasts.

PURPURA, Bruguière.

242. Purpura crispata, Chemnitz, sp.

Buccinum crispatum, Chem., Mart. Conch. Cab., vol. xi., p. 84, pl. 187, figs. 1802, 1803 (1795).
= *M. lactuca* and *M. ferrugineus*, Esch. (1829).
etc., etc.

243. Purpura lima, Martyn, sp.

Buccinum lima, Mart., Univ. Conch., vol. ii., no. 46, pl. xv., fig. 1 (1784).
= *canaliculata*, Duclos (1832).
= *decemcostata*, Midd. (1849).

244. Purpura saxicola, Valenciennes.

Zool. Voy. Venus, pl. viii., fig. 4 and 4a (1846).

These three species of Purpura are all common on rocks between tides and here at any rate are quite distinct from one another in all their varieties.

From some few localities these shells are absent without any apparent cause. For instance, during three days shore collecting at Nanaimo last year, I did not see a single specimen of either *lima* or *saxicola* and only in one spot a few specimens of *crispata*.

There are conchologists who would place all these species under one name and there are others who would consider even this a synonym of the *Purpura lapillus* of the Atlantic. Many varieties of *P. saxicola* have been honoured with separate names, which however are hardly worth preserving.

SCALA, Humphrey.

245. Scala Indianorum, Carpenter, sp.

Scalaria Indianorum, Cpr., Rept. Brit. Assoc., 1863, p. 660 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xv., p. 31 (January, 1865).

This species is not very abundant. It has been dredged at Departure Bay, Baynes Sound and Comox, at Discovery Passage, and at the Queen Charlotte Islands, but has not yet been found at Victoria.

The type specimens were from Swan's collections from Neeah Bay.

OPALIA, H. & A. Adams.

246. Opalia borealis, Carpenter.

Rept. Brit. Assoc., 1863, p. 660 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xv., p. 31 (January, 1865).

Found by the United States Exploring Expedition in Puget Sound and indicated, but not described, by Gould in *Expl. Exped. Mollusca*, p. 207. The shell was obtained also by Swan at Neeah Bay and Tatooche Island.

In British Columbia I have never found *O. borealis* alive, but have many times received the dead shells from various points on the west coast of Vancouver Island. Dr. Newcombe has been more fortunate than I have and has taken living specimens at Clayoquot Sound. Professor Macoun found a few very large dead specimens at Sooke.

EULIMA, Risso.

247. Eulima micans, Carpenter.

Rept. Brit. Assoc., 1863, p. 659 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 63.

?? = *Turbo politus*, Linn., Syst. Nat., ed. xii, vol. i, pt. 2, p. 1241, no. 653 (1767).

This species is probably, but not certainly, the same as the *E. polita* of Europe. For the present therefore the name applied by Carpenter to the western shell is retained. The species is widely distributed in our seas and in some localities is rather common.

It has been dredged at Victoria, Departure Bay, Comox and Clayoquot and at numerous points in Queen Charlotte Sound, the Straits of Georgia, Johnston Straits and at the Queen Charlotte Islands.

It is usually found in sand at a depth of 10 to 40 fathoms.

248. Eulima sp.

A second species of *Eulima* is recorded by Whiteaves, under the name "*Eulima incurva*, Renieri = *E. distorta*, Auct," as having been

dredged by Dr. Dawson in the Straits of Georgia, Forward Bay and Alert Bay and as occurring between tides in Discovery Passage and Goletas Channel. I have found specimens of the same shell at Victoria and Departure Bay both between tides and by dredging, and Dr. Newcombe has specimens from Clayoquot Sound.

Renieri I believe only published the *name* without any description, and as our shell does not appear to be the same as the *E. distorta*, Deshayes, of English conchologists, I am not sure that it has at present any proper name.

TURBONILLA, Risso.

249. Turbonilla tridentata, Carpenter, sp.

Chemnitzia tridentata, Cpr., Rept. Brit. Assoc., 1863, p. 659 (August, 1864); and Journ. de Conch., vol. xii., p. 147 (April, 1865).

This species was described from Puget Sound (Kennerley) and from Sta. Barbara, Monterey and San Pedro. It has not been found in our waters by recent collectors.

250. Turbonilla Lordi, E. A. Smith, sp.

Chemnitzia Lordi, E. A. S., Ann. Mag. Nat. Hist., series 5, vol. vi., p. 288 (1880).

A very few specimens of this species have been dredged by Dr. Newcombe and myself in Departure Bay. I have compared some of these with Mr. Smith's types. This is the largest species of *Turbonilla* found in British Columbia.

251. Turbonilla torquata, Gould, sp.

Chemnitzia torquata, Gould, Bost. Journ. Nat. Hist., vol. vi., no. 3, p. 384, pl. xiv., fig. 16 (October, 1853).

= *C. Vancouverensis*, Baird, Proc. Zool. Soc. London, 1863, p. 67, pl. i., fig. 3.

252. Turbonilla chocolata, Carpenter, sp.

Chemnitzia chocolata, Cpr., Rept. Brit. Assoc., 1863, p. 659 (August, 1864); and Proc. Cal. Acad. Nat. Sci., vol. iii. (1866).

These two species are I think equally common. *T. chocolata* has been dredged at Victoria, Departure Bay and Clayoquot Sound. *T. torquata*, at the two first named places and also at Duncan Bay, Forward Bay and Cullen Harbour (Vancouver Island). Doubtless both species will be found in other localities when search is made. In California *T. torquata* is said to occur abundantly on the shells of *Haliotis* (Orcutt).

ODOSTOMIA, Fleming.

253. Odostomia nuciformis, Carpenter, and var. avellana, Carpenter.

Rept. Brit. Assoc., 1863, p. 658 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xv., p. 30 (January, 1865).

254. Odostomia satura, Carpenter, and var. gouldii, Carpenter.

Rept. Brit. Assoc., 1863, p. 658 (August, 1864); and Ann. Mag. Nat. Hist., series 3. vol. xv , p. 30 (January, 1865).

255. Odostomia inflata, Carpenter.

Rept. Brit. Assoc., 1863, p. 658 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xv., p. 395 (May, 1865).

256. Odostomia tenuisculpta, Carpenter.

Rept. Brit. Assoc., 1863, p. 659 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xv., p. 30 (January, 1865).

257. Odostomia straminea, Carpenter.

Rept. Brit. Assoc., 1863, p. 659 (August, 1864), and Journ. de Conch., vol. xii., p. 146 (April, 1865).

258. Odostomia Sitkensis, Dall.

259. Odostomia gravida, Gould.

Bost. Journ. Nat. Hist., vol. vi., no. 3, p. 384, pl. xiv., fig. 14 (October, 1853).

The Odostomias of British Columbia have not yet been satisfactorily worked up. Specimens are very common both between tides and among dredged material, and I have accumulated many hundred shells. I have never yet, however, had an opportunity of either critically examining these myself or submitting them to competent authority and therefore cannot write with confidence upon the subject.

Of the seven species enumerated above, two, *O. inflata* and *O. tenuisculpta*, are quoted on the strength of specimens collected by Swan in Puget Sound.

A third, *O. Sitkensis*, is recorded by Whiteaves from the Queen Charlotte Islands and False Bay, Lasqueti Island; this species and *O. straminea* being apparently the only ones met with by Dr. Dawson.

The other four species are in my own collection.

O. satura, or the shell that I think to be this species, is the common large form in Departure Bay.

O. nuciformis, which is the most easily recognized of our species

(from its large size and Tornatelloid shape) occurs rarely under stones at low tide at Victoria, Esquimalt, Salt Spring Island, Nanaimo, etc. I have never found more than one or two specimens of this species together.

O. gravida and *O. straminea* are smaller shells and have been dredged in various localities round Vancouver Island, and a single specimen of the last named was taken at the Queen Charlotte Islands by Dr. Dawson.

There are three or four other forms for which I have not yet been able to find satisfactory names, and I am inclined to the opinion that they belong to undescribed species.

TRITONIUM. Cuvier.

260. Tritonium oregonense, Redfield, sp.

Triton Oregonense, Redf., Ann. Lyc. Nat. Hist. N.Y., vol. iv., no. 5, p. 165, pl. xi., fig. 2a and 2b (1846).
= *T. cancellatum*, Midd. and others, but not of Lamarck.

This species is very common at Victoria from low water mark to twenty or thirty fathoms. The dead shells often contain beautiful specimens of *Crepidula navicelloides*, and on one occasion, as mentioned on page 23 above, I dredged a living specimen with a colony of some twenty or thirty specimens of *T. unguicula* attached to its hairy epidermis.

I have not found this species at Nanaimo, but it appears again further to the north, having been taken by Dr. Dawson both at low water and by dredging in Johnston and Broughton Straits, in Goletas Channel, and at the Queen Charlotte Islands.

Mr. Whiteaves in his paper in these Transactions (vol. iv., 1886), writes that this species is possibly only a local variety of the South American *T. cancellatum*, of Lamarck, but Dr. Dall in the 'Proceedings of the United States National Museum' for the same year[1] (1886, p. 213) has shown that the two species are quite distinct and in their geographical range widely separated.

TRIFORIS, Deshayes.

261. Triforis adversa, Montagu, sp.

Murex adversus, Mont.

This is recorded by Carpenter as being in Swan's Neeah Bay col-

[1] "Contributions to the Natural History of the Commander Islands, No. 6." This paper contains many valuable notes on the northern distribution of our shells. The following species are quoted from Bering Island in addition to others already referred to in note under *Penitella penita* above :—*Pecten Alaskensis? Placunanomia macrochisma, Modiolaria laevigata, Cuspidaria pectinata, Siphonaria Thersites, Bela violacea, Buccinum percrassum, Tritonium Oregonense, Natica clausa, Acmæa patina, Solariella varicosa*, and *Lepidopleurus cancellatus*.

lections. He remarks of this and the next species, "Rare, no differences have been detected on comparing the Herm (British) and Neeah Bay specimens."

T. adversa does not appear to have been noticed here by recent collectors.

Dr. Gwyn Jeffreys considered this species to be equivalent to the Mediterranean form, = *perversum*, Linne, but Forbes and Hanley considered the two to be distinct.

CERITHIOPSIS, Forbes and Hanley.

262. Cerithiopsis tuberculata (Montagu) Carpenter.

? *Murex tubercularis*, Mont., Test. Brit., p. 270 (1803).

This is another species from Swan's collection.

Carpenter considered it identical with the English shell, but Jeffreys (Brit. Conch., iv., 268) says that it is not the same. Dr. Dawson took it at Dolomite Narrows and in Virago Sound (at the latter place in 8-15 fathoms), and I have found it under stones at low tide near Victoria.

263. Cerithiopsis munita, Carpenter.

Rept. Brit. Assoc., 1863, p. 660 (August, 1864); and Ann. Mag. Nat Hist., series 3, vol. xv., p. 32 (January, 1865).

264. Cerithiopsis columna, Carpenter.

Rept. Brit. Assoc., 1863, p. 660 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xv., p. 32 (January, 1865).

Both of these species were first found by Swan at Neeah Bay. They are evidently rare with us, a very few specimens only having been found near Victoria.

BITTIUM, Leach.

265. Bittium filosum, Gould, sp.

Cerithium filosum, Gould, Proc. Bost. Soc. Nat. Hist., vol. iii., p. 120 (May, 1849); and U. S. Expl. Exped., Mollusca, p. 149, fig. 175,-175c (1852).

Var. *esuriens*, Cpr., Rept. Brit. Assoc., 1863, p. 655 (August, 1864); Ann. Mag. Nat. Hist., series 3, vol. xv., p. 181 (March, 1865); and Journ. de Conch., vol. xii., p. 142 (April, 1865).

Very common everywhere between tides. The common form has the mouth of the shell purplish or chocolate coloured within, but specimens from Clayoquot Sound and a few collected at Salt Spring Island, are pure white.

266. Bittium armillatum, Carpenter.

Rept. Brit. Assoc., 1863, p. 655 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xvii., p. 276 (April, 1866).

Not rare among sponges in rock pools and under stones between tide marks, near Victoria. It is not uncommon in California.

TRICHOTROPIS, Broderip and Sowerby.

267. Trichotropis cancellata, Hinds.

Proc. Zool. Soc., London, 1843, p. 17; and Zool. Voy. Sulph., vol. ii., p. 39, pl. xi., fig. 11 and 12 (1844).

This shell has been dredged not rarely at Victoria, Departure Bay and Comox, in 10-30 fathoms, and at a greater depth. Dr. Dawson procured it at the Queen Charlotte Islands, in the Straits of Georgia, Queen Charlotte Sound, and in most of the localities in which he collected in 1885. Dr. Jeffreys (Brit. Conch., iv., 248) places *T. cancellata.* in the synonymy of *T. borealis*, Brod. and Sby.

268. Trichotropis inermis, Hinds.

Proc. Zool. Soc. London, 1843, p. 18; and Zool. Voy. Sulph., vol. ii., p. 40. pl. xi., figs. 13 and 14 (1844).

We have never found any shells that could be referred to this species, which is on our list on the strength of a few specimens collected by Swan at Neeah Bay.

CÆCUM, Fleming.

269. Cæcum crebricinctum, Carpenter.

Rept. Brit. Assoc., 1863, p. 655 (August, 1864); and Proc. Cal. Acad. Sci., vol. iii. (1866).

This little shell has only been once found in British Columbia, and then but a single dead specimen. This was obtained by Dr. Dawson at Dolomite Narrows in 1878.

BIVONIA, Gray.

270. Bivonia compacta, Carpenter.

Rept. Brit. Assoc., 1863, p. 654 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xiv., p. 427 (December, 1864).

B. compacta is generally found upon shells of *Pachypoma inæquale*, and appears to have a range coextensive with that of that species.

Dr. Dawson, however, found it at Discovery Passage on *Trophon tenuisculptus*, and at Quatsino Sound on *Pecten hastatus.*

MESALIA, Gray.

271. Mesalia reticulata, Mighels and Adams, sp.

Turritella reticulata, M. & A., Proc. Bost. Soc. Nat. Hist., vol. i., p. 50 (November, 1841); and Bost. Jour. Nat. Hist., vol. iv., no. 1, p. 50, pl. iv., fig. 19 (January, 1842).
= *T. lactea*, Möller (1842).
= *M. lacteola*, Cpr. (1864).

A very common shell in sand in ten to thirty fathoms. It has been dredged in nearly all the localities where dredging has been carried on, from Victoria to the Queen Charlotte Islands.

LITTORINA, Ferussac.

272. Littorina sitchana, Philippi.

Proc. Zool. Soc. London, 1845, p. 140.

This shell is most probably only a form of the Atlantic *L. rudis*, and if so has an extensive range and also a very extensive synonymy.

It is an abundant and variable littoral shell occurring throughout our province.

273. Littorina scutulata, Gould.

Proc. Bost. Soc. Nat. Hist., vol. iii., p. 83 (March, 1849); and U. S. Expl. Exped., Mollusca, p. 200, figs. 241, 241*a* (1852).

Quite as abundant as *L. sitchana*, and occurring with it on all our coasts.

LACUNA, Turton.

274. Lacuna vincta, Montagu, sp.

Turbo vincta, Mont., Test. Brit., p. 308 (1803).
= *carinata*, Gould.
= *solidula*, Loven.
= *divaricata*, O. Fab.
vars. = *effusa*, *exæquata* and *porrecta*, Cpr.

This is a very variable shell occurring on *Zostera* at low water on all our coasts.

275. Lacuna variegata, Carpenter.

Rept. Brit. Assoc., 1863, p. 656 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xiv., p. 428 (December, 1864).

This species occurs with the last named at Victoria and Saanich, but is not so common as is *L. vincta*.

L. variegata has not been noticed so far in other parts of the province, though no doubt it will be found when more carefully looked for.

ISAPIS, H. & A. Adams.

276. Isapis fenestrata, Carpenter.

Rept. Brit. Assoc., 1863, p. 656 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xiv., p. 429 (December, 1864).

This species was "very rare" in Swan's collection from Neeah Bay. It has not been found since except at Clayoquot Sound, where a few specimens were obtained last year in shallow water by Dr. Newcombe.

ALVANIA, Risso.

277. Alvania compacta, Carpenter, sp.

Rissoa compacta, Cpr., Rept. Brit. Assoc., 1863, p. 656 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 62.

278. Alvania filosa, Carpenter.

Rept. Brit. Assoc., 1863, p. 656 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xv., p. 28 (January, 1865).

279. Alvania reticulata, Carpenter.

Rept. Brit. Assoc., 1863, p. 656 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xiv., p. 429 (December, 1864).

280. Alvania castanea, Möller, sp.

Rissoa castanea, Möller, Index Moll. Grœnl., p. 9 (1842).

Our four species of *Alvania* are found under stones, or at the bases of sponges, at low water, but from their small size are easily overlooked.

I have found the first three on many occasions at Victoria, Salt Spring Island and Nanaimo.

Dr. Dawson obtained a few specimens of *compacta* and *reticulata* at the Queen Charlotte Islands, the former species at Dolomite Narrows, and the latter in Virago Sound.

A. castanea is known from this province by a single specimen taken by Dr. Newcombe, in Clayoquot Sound. This species seems to be intermediate, as to sculpture, between *A. filosa* and *A. reticulata*.

BARLEEIA, Clark.

281. Barleeia haliotiphila, Carpenter.

Rept. Brit. Assoc., 1863, p. 656 (August, 1864); and Journ. de Conch., vol. xii., p. 144 (April, 1865).

Common among corallines in tide pools near Victoria and probably all along the coast.

The single specimen dredged by Dr. Dawson in Freshwater Bay,

Queen Charlotte Sound, and recorded by Mr. Whiteaves as *B. subtenuis*, was most likely of the present species. *B. subtenuis* is common to the south of us and is distinguished by being wider and altogether much larger than *B. haliotiphila*.

HYDROBIA, Hartmann.

282. Hydrobia Californica, Tryon.

Amer. Journ. Conch., vol. i., p. 221, pl. xxii., fig. 11 (1865).

Very common under stones between tides in brackish water in the Victoria Arm and in Ganges Harbour, Salt Spring Island.

PALUDINELLA, Pfeiffer.

283. Paludinella castanea, Carpenter.

Paludinella sp., Cpr., Rept. Brit. Assoc., 1863, p. 656 (August, 1864).
Paludinella castanea, Cpr., Ann. Mag. Nat. Hist., series 3, vol. xv., p. 28 (January, 1865).

Of this species Swan obtained a single specimen at Neeah Bay.

ASSIMINIA, Leach.

284. Assiminia subrotundata, Carpenter.

Rept. Brit. Assoc., 1863, p. 656 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xv., p. 28 (January, 1865).

This species like the last is known only by the single specimen obtained by Swan at Neeah Bay.

Two freshwater species will follow here,—

285. Fluminicola Nuttalliana, Lea., sp.

286. Valvata virens, Tryon.

GALERUS, Humphrey.

287. Galerus fastigiatus, Gould, sp.

Calyptræa fastigiata, Gould, Proc. Bost. Soc. Nat. Hist., vol. ii., p. 161 (Aug., 1846); and U. S. Expl. Exped., Mollusca, p. 379, figs. 484-484b (1852).

Very common; attached to stones and dead shells in ten to twenty fathoms all round the coast to the Queen Charlotte Islands. It is probable that our shell is the same as the *Galerus mammillaris*, Broderip.

CREPIDULA, Lamarck.

288. Crepidula dorsata, Broderip, sp.

Calyptræa dorsata, Brod., Proc. Zool. Soc. London, 1834, p. 38; and Trans. Zool. Soc. London, vol. i., p. 202, no. 20, pl. xxviii, fig. 10.

This species is common in several varieties.

Sometimes the shell is internally of a rich purple. This form is usually found on shells of *Ostrea lurida.*

Another variety is white streaked and spotted with brown or sometimes wholly white. This is found attached to shells and stones dredged from deeper water and also occasionally between tides on the under sides of rocks, or on dead bivalves, or in the disused burrows of *Penitella penita.*

289. Crepidula adunca, G. B. Sowerby.

Tankerville Cat., app. vii., no. 828 (1825).

This is a common littoral species. Near Victoria it is generally found attached to shells of *Euthria dira* and *Calliostoma costatum.* On the west coast Dr. Newcombe found its station to be on *Phorcus pulligo*, while in California, according to Orcutt, it is usually attached to shells of *Norrisia norrisii.* Dr. Dawson found *C. adunca* in Queen Charlotte Sound and at the Queen Charlotte Islands.

290. Crepidula navicelloides, Nuttall.

Common and variable. A large rough form beautifully marked inside with green and purple is not uncommon on the rocks at Esquimalt. Another form of a pure white, is found under stones between tides on all our coasts. A third variety occurs in dead bivalves dredged at various depths, and a fourth is in dead Gasteropoda, e.g., *Calliostoma*, *Tritonium*, and many others,

AMALTHEA, Schumacher.

291. Amalthea cranioides, Carpenter, sp.

Hipponyx cranioides, Cpr., Rept. Brit. Assoc., 1863. p. 654 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xiv., p. 427 (December, 1864).

This is a rare shell on the east coast of Vancouver Island but apparently more common on the west, as I have seen many dead shells brought thence by the Indians.

Dr. Dawson found one living specimen at the Queen Charlotte Islands, and I have myself found it, but only once at Victoria.

NATICA, Lamarck.

292. NATICA CLAUSA, Broderip and Sowerby.

Zool. Journ., vol. iv., pt. 15, p. 372 (1829); and Zool. Voy. Blossom, p. 136, pl. xxxiv., fig. 3. and pl. xxxvii., fig. 6 (1839).

Not a very common species but found in nearly all localities in which dredging has been carried on.

Most of my specimens were dredged in about twenty fathoms in Departure Bay. The adult shell is nearly unicolorous, but the young are prettily marked with dark stripes. Dr. Newcombe has found this species fossil in the boulder clay.

LUNATIA, Gray.

293. LUNATIA LEWISII, Gould, sp.

Natica Lewisii, Gould, Proc. Bost. Soc. Nat. Hist., vol. ii., p. 239 (July, 1847); and U. S. Expl. Exped., Mollusca, p. 211, fig. 253 and 253a (1852).

Common at and above low water mark, burrowing in the sand as the tide recedes. The annular egg ribbons of this species are frequently seen on the beaches and are very puzzling to those who are unacquainted with their true nature.

294. LUNATIA PALLIDA, Broderip and Sowerby, sp.

Natica pallida, Br. & Sby., Zool. Journ., vol. iv., pt. 15, p. 372 (1829); and Zool. Voy. Blossom, p. 136, pl. xxxiv, fig. 15 (1839).

= *L. caurina* and *L. soluta*, Gould.

Not rare in ten to forty fathoms at Victoria and Departure Bay. Dr. Newcombe records it from Comox, and Dr. Dawson from Queen Charlotte Sound. This species may easily be distinguished from the young of *L. Lewisii*, by the shape of the whorls and by its much smaller umbilicus.

LAMELLARIA, Montagu.

295. LAMELLARIA STEARNSII, Dall.

Amer. Journ. Conch., vol. vii, p. 122, pl. xv., figs. 2, 3 and 6 (November, 1871).

= *L. depressa*, Dall, MS. 1866.

I have only two notes of the occurrence of this shell in our waters. One dead specimen was dredged in Houston-Stewart Channel (Q. C. I.), in fifteen to twenty fathoms by Dr. Dawson in 1878, and a second example was obtained by Dr. Newcombe in Clayoquot Sound last summer. The original (type) specimens were found dead on the beach at Monterey.

VELUTINA, Fleming.

296. Velutina lævigata (Linn.) Auct.

This shell has long gone under the above name but, as many authors have pointed out, it cannot be the *Helix lævigata* of Linne [Syst. Nat., ed. xii., vol. 1, pt. 2, p. 1250, no. 709 (1767)] the description of which is quite inapplicable to our shell. Jeffreys (Brit. Conch., vol. iv., p. 242) retains the familiar name but quotes Pennant (Brit. Zool., vol. iv., p. 140, pl. lxxxvi., fig. 139) as the authority, his description and figure being in accord with the shell in question.

Several American conchologists have used the name *haliotoides*, O. Fab., but though the species under consideration is no doubt the *haliotoides* of Fabricius, it is not the *haliotoides* of Müller or of Linne, both earlier in date than Fabricius. (Jeffreys.)

V. lævigata, if we may continue for the present to call it by this name, is not uncommon, attached to stones and shells dredged in ten to thirty fathoms. It has been found at Victoria, Departure Bay, Comox, Clayoquot Sound (Dr. Newcombe) and Discovery Passage (Dr. Dawson.)

297. Velutina prolongata, Carpenter.

Rept. Brit. Assoc., 1863, p. 661 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xv., p. 32 (January, 1865).

This is a rare species. Carpenter described it as rare in Swan's collection and since that time it has only been found in British Columbia by Dr. Newcombe, who took some very large specimens between tides at Victoria and who has found others at the roots of *Macrocystis* at Clayoquot Sound.

V. prolongata has been found, according to Dr. Dall, both to the north and to the south of us, from Sitka to Monterey.

ACMÆA, Eschscholtz.

298. Acmæa patina, Eschscholtz.

Zool. Atlas, pt. 5, p. 19, pl. xxiv, figs. 7, 8 (1833).

Those who wish information as to the rather extensive synonymy of this and other west coast limpets are referred to the papers of Drs. Carpenter [1] and Dall [2] in the American Journal of Conchology; of Dr. Dall [3] in the 'Proceedings of the United States National Museum,' and of Dr. Pilsbry in volume xiii. of the Manual of Conchology.

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[1] "On the Acmæidæ of the Vancouver and Californian province" Amer. Journ. Conch., vol. ii, pp. 332-348 (1866).

[2] "On the Limpets; with special reference to the species of the west coast of America, and to a more natural classification of the group." Amer. Journ. Conch., vol. vi., pp. 227-282, pl. xiv. to xvii. (1870).

[3] "Report on the Limpets and Chitons of the Alaskan and Arctic regions with descriptions of genera and species believed to be new." Proc. U. S. Nat. Mus., I. pp. 281-344, 5 plates (1878).

Dr. Dall unites *A. patina* with the Atlantic *A. testudinalis*, of Müller (Prodr. Zool. Dan., p. 237, 1776), but Pilsbry, and with him I agree, considers that as the Pacific shell is in nearly all its variations readily distinguishable from its Atlantic analogue, there is no good purpose to be served by dropping our west coast name.

A. patina is extremely abundant in this province and very variable. I have collected and carefully studied many thousands of specimens and I am not even yet quite satisfied that we are not now erring in uniting forms that are specifically distinct, as we erred before by indulging in excessive subdivisions.

A small deep water variety? of *patina* is no larger than and has somewhat the shape of *A. virginea*. A narrow and compressed variety occurring of leaves of *Zostera* at extreme low tide, seems to represent the Atlantic *A. alveus*, Conrad. Giant specimens found between tide marks sometimes attain a length of nearly three inches.

In nearly all our Vancouver Island localities two forms, very different to each other, exist side by side. The one is large and flat with an open colour pattern, the other more conical, darker in colour and with the markings much more delicate and close. This last is evidently the *A. scutum* of Eschscholtz, and in some of its varieties can hardly be distinguished from the Chilian *A. scutum* of D'Orbigny. Near Victoria it is rare to find a specimen that cannot at once be referred to the one or the other of these two forms.

Dr. Jeffreys (in a paper which I have referred to under *Modiolaria marmorata*) speaks of this species as being very common in Japan, where however I do not think it occurs at all.

The variety *ochracea*, Dall, described from Monterey, is credited to Vancouver Island by Dr. Pilsbry, but I have never seen a native specimen.

299. Acmæa pelta, Eschscholtz.

Zool. Atlas, pt. 5, p. 19, no figure (1833).
+ *A. cassis*, Esch, Zool. Atlas, pt. 5, p. 19, pl. xxiv, fig. 3 (1833).
etc., etc.

This species is almost as common as *A. patina*. It is very variable but it does not approach the last named in any of its forms. In the adult shells the interior is often entirely white, but there is a curious variety in which the interior is marked with numerous and close raised lines of purplish brown radiating from apex to the edge.

300. Acmæa persona, Eschscholtz.

Zool. Atlas, pt. 5, p. 20, pl. xxiv., figs. 1 and 2 (1833).
+ *digitalis*, Esch., etc., etc.

This is a smaller species than either *A. patina* or *A. pelta*, and is not quite so common. It is generally found very near high-water mark, and consequently it must spend much of its time out of water.

Californian specimens of *A. persona* are very different in appearance to Vancouver Island ones, and might at first sight be considered as belonging to a distinct species.

The nearest ally of *A. persona* is, to my mind, the *Acmæa dorsuosa*, Gould, from Japan.

Dr. Pilsbry sees a resemblance to *persona* in the Chilian *A. ceciliana*, D'Orb., and has described an intermediate form as *A. subpersona*. I have never seen this last named shell, the figure of which certainly does look like *persona*, but I have examined scores of *A. ceciliana*, and never saw one in the slightest degree approaching our *A. persona*. If Dr. Pilsbry's *A. subpersona* is really a Chilian form, I should certainly be inclined to give it specific rank.

301. Acmæa instabilis, Gould, sp.

Patella instabilis, Gould, Proc. Bost. Soc. Nat. Hist., vol. ii., p. 150 (July, 1846); and U. S. Expl. Exped., Mollusca, p. 346, figs. 454, 454*a* (1852).

This is not a common limpet, and it has so far been found living in British Columbia only on the west coast of Vancouver Island, where it occurs on the stems of *Macrocystis*.

A. instabilis has been considered by some conchologists to be only a kelp form of *A. pelta*, but Dr. Pilsbry with others (myself included) consider this by no means proven.

302. Acmæa mitra, Eschscholtz.

Zool. Atlas, pt. 5, p. 18, pl. xxiii., fig. 4 (1833).

Common at low tide on all our coasts. Often coloured green or pink by encrusting nullipore.

Acmæa scabra, Nuttall, common in California, has been quoted from Vancouver Island, but I have never seen a native specimen, and do not believe that it occurs here.

CRYPTOBRANCHIA, Middendorff.

303. Cryptobranchia concentrica, Middendorff.

Patella caeca, var. *concentrica*, Midd., Bull. Acad. Sci. St. Peters., vol. vi., no. 20, p. 319 (November, 1847).
= *Lepeta caecoides*, Cpr., Rept. British Assoc., 1863, p. 651 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 60.

Not uncommon, attached to stones or dead shells dredged at Victoria, Departure Bay, Comox and Clayoquot. Also off Metlakatla in twenty fathoms, off False Head and in Quatsino Sound (Dr. Dawson).

For notes on the anatomy of this species and its distribution, and

for descriptions of nearly allied forms, see Dall (in Amer. Jour. Conch., vol. v., p. 140 *et seq.*), "Materials for a Monograph of the Family Lepetidæ."

LEPTOTHYRA, Carpenter.

304. Leptothyra Carpenteri, Pilsbry.

= *Leptothyra sanguinea*, Cpr., non Linne.

Not common in the southern part of the province. I have taken it alive between tides at Victoria, and so has Dr. Newcombe, and Prof. Macoun found it in a similar station at Sooke.

Dr. Dawson dredged it in several Queen Charlotte Island localities and also in the Queen Charlotte and Quatsino Sounds. He also found it between tides in Johnston and Broughton Straits, in the Goletas Channel, and on the east side of Queen Charlotte Sound.

It is very common in the little baskets of dead shells that the Indians from northern points bring to Victoria for sale, but I do not know the exact locality whence these are obtained.

305. Leptothyra bacula, Carpenter.

Leptonyx bacula, Cpr., Rept. Brit. Assoc., 1863, p. 652 (August, 1864); and Proc. Cal. Acad. Sci., vol. iii., 1865.

This little shell, which is not rare to the south of us, has not been found in British Columbia except by myself, and I have taken two specimens only, near Victoria.

PACHYPOMA, Gray.

306. Pachypoma inæquale, Martyn, sp.

Trochus inæqualis, Mart., Univ. Conch., vol. i., no 31, pl 8, fig 4 (1784).
= *T. gibberosus*, Chem. (1788).

This is a species which in British Columbia is confined to the north and west. It was reported by Dr. Dawson, "Common on rocks at low water" at the Queen Charlotte Islands; and again, "On rocks and kelp at a little below low-water mark in Quatsino Sound, abundant in some localities." It has been taken also on the west coast of Vancouver Island by Dr. Newcombe and others.

Very often groups of *Bivonia compacta* are attached to specimens of this shell.

The opercula of this species are commonly used by the Indians for ornamenting wooden and other wares.

Dr. Carpenter adopted Chemnitz name, being apparently not quite convinced that our shell was the one described and figured by Martyn and which was said to inhabit the Friendly Islands.

CHLOROSTOMA, Swainson.

307. Chlorostoma funebrale, A. Adams.

Proc. Zool. Soc. London, 1854, p. 316.

This species, like the last-named, is confined to our northern and northwestern coasts.

It is not uncommon, where it occurs, and is usually found living at, or just below, low-water mark.

Dr. Dawson found it abundant between Nahwitti Bar and Quatsino Sound. Professor Macoun collected many specimens at Alberni in 1887, and Dr. Newcombe found it at Clayoquot Sound last year.

Dr. Newcombe in his catalogue credits this species to the Queen Charlotte Islands on the authority of Dr. Dawson, but I cannot find the record in any of Mr. Whiteaves's papers on Dr. Dawson's collections.

GIBBULA, Risso.

308. Gibbula pulligo, Martyn, sp.

Trochus pulligo, Mart., Univ. Conch., vol. ii., no. 76, pl. xxvi., fig. 4 (1784).

This is another west coast species with a distribution apparently similar to that of the last named. These shells are most frequently found on the fronds of *Macrocystis pyrifera*.

CALLIOSTOMA, Swainson.

309. Calliostoma annulatum, Martyn, sp.

Trochus annulatus, Mart., Univ. Conch., vol. 1, no. 33, pl. x., fig. 2 (1784).

This species is not very common. Most of the specimens I have seen are from Victoria where the species is dredged in shallow water, and sometimes, though very rarely, is found above low-water mark.

Dr. Dawson found two specimens in Houston-Stewart Channel and a single small one in Forward Bay. I did not obtain this species in Departure Bay nor have I yet seen it from the west coast of Vancouver Island.

310. Calliostoma canaliculatum, Martyn, sp.

Trochus canaliculatus, Martyn, Univ. Conch., vol. i., no. 32, pl. x., fig. 1 (1784).

This species apparently belongs to the west coast of Vancouver Island although it has been dredged near Victoria, on one occasion, by Dr. Newcombe.

Dr. Newcombe has also taken it, alive, at Clayoquot Sound and Dr.

Dawson obtained four specimens in Virago Sound. Like the other west coast *Trochidæ* this species appears to be partial to *Macrocystis*.

311. CALLIOSTOMA COSTATUM, Martyn, sp.

Trochus costatus, Mart., Univ. Conch., vol. i., no. 34, pl. x., fig. 3 (1784).
ligatum, Gould,
&c., &c.

This is our common *Calliostoma* and unlike the two species above mentioned is usually found between tides. The living shell very often has specimens of *Crepidula adunca* attached to it and when dead has not unfrequently *Crepidula navicelloides* within the aperture.

312. CALLIOSTOMA VARIEGATUM, Carpenter.

Rept. Brit. Assoc., 1863, p. 652 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 61.

Dr. Kennerley found one living specimen of this shell in Puget Sound, but I can find no other record of its occurrence in British Columbian waters.

CANTHARIDUS, Montfort.

313. CANTHARIDUS PUPOIDEUS, Carpenter, sp.

Fenella pupoidea, Cpr., Rept. Brit. Assoc., 1863, p. 656 (August, 1864); and Proc. Cal. Acad. Sci., vol. iii. (1865).

This shell which Carpenter placed in *Fenella*, is considered by Dr. Dall to belong to the subgenus *Halistylus* (Dall) of the genus *Cantharidus* (Montfort). It was described from specimens taken near Monterey, California, and was added to our list by Dr. Dawson, who took one adult living specimen at the mouth of Cumshewa Harbour in twenty fathoms.

Last summer Dr. Newcombe took four living specimens, and a few dead ones, at Clayoquot Sound. We have not yet found it on the eastern side of Vancouver Island.

MARGARITA, Leach.

314. MARGARITA HELICINA, O. Fabricius, sp.

Trochus helicinus, O. Fab., Fauna Groenl., p. 393, (1780).

Fine specimens, exactly like European ones, are common between tides in a few spots in the neighbourhood of Victoria, also at Sooke (Macoun). A few specimens were taken by Dr. Dawson at the Queen Charlotte Islands, and in Johnston Strait, and Queen Charlotte Sound.

315. Margarita Vahlii, Möller.

Index Moll. Groenl., p. 8 (1842).

Three specimens, which Carpenter referred with doubt to this species, were collected by Dr. Kennerley in Puget Sound. I have not heard of any other specimens being taken in our waters, the shell recorded by Mr. Whiteaves under this name as having been collected by Mr. Richardson at Victoria, being referable to *Solariella varicosa*.

316. Margarita pupilla, Gould, sp.

Trochus pupillus, Gould, Proc. Bost. Soc. Nat. Hist., iii., p. 91 (March, 1849).
var. = *inflata*, Cpr.

This species is a very abundant one with us. It is found both between tides and down to thirty or forty fathoms, the deep and shallow water forms being constantly distinct.

It occurs all through the province, being one of our commonest shells.

317. Margarita lirulata, Carpenter.

Rept. Brit. Assoc., 1863, p. 653 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 61.

According to Dr. Dall the *Margarita tenuisculpta* of Carpenter and five of the same author's species of *Gibbula*, viz., *obtabilis*, *parcipicta*, *funiculata*, *succincta* and *lacunata*, are all forms of this very variable species. Dr. Dall's opinion was based on the examination of very numerous specimens. In British Columbia *M. lirulata* is very abundant indeed on and under rocks between tides, the commonest form being one answering to the description of *Gibbula succincta*. Specimens dredged are usually of the more brightly coloured and highly sculptured varieties.

SOLARIELLA, Searles Woods.

318. Solariella varicosa, Mighels and Adams, sp.

Margarita varicosa, M. and Ad., Proc. Bost. Soc. Nat. Hist., vol. i., p. 49 (November, 1841); and Bost. Journ. Nat. Hist., vol. iv., no. 1, p. 46, pl. iv., fig. 14 (January, 1842).
= *Trochus* (*Margarita*) *Vancouverensis*, E. A. Smith, Ann. Mag. Nat. Hist., series 5, vol. vi., p. 288 (1880).

This is not a very common shell with us, having only been met with at Victoria and off Pender Island (Newcombe).

Dr. Dall was kind enough to compare my shells with Atlantic specimens and assures me that they exactly correspond. I have myself

compared specimens from Victoria with Mr. Smith's type of *Vancouverensis*, in the Natural History Museum (South Kensington), and found them to agree in every particular.

319. SOLARIELLA PERAMABILIS, Carpenter.

Rept. Brit. Assoc., 1863, p. 653 (August, 1864); and Proc. Cal. Acad. Sci., vol. iii., 1865.

This rare shell was first found at Catalina Island, California, by Dr. Cooper. In our province six fine living specimens were dredged by Dr. Dawson off False Head, Vancouver Island, in thirty fathoms, and one dead shell, in fair condition, was dredged by myself in Departure Bay in 1888.

320. SOLARIELLA CIDARIS, Carpenter, sp.

Margarita cidaris (A. Ads.) Cpr., Rept. Brit. Assoc., 1863, p. 653 (August, 1864); and Ann. Mag. Nat. Hist., series 3, vol. xiv., p. 426 (December, 1864).

Until 1885 this beautiful species was known only by the unique type specimens collected by Swan in Puget Sound. In that year Dr. Dawson dredged a splendid series of twenty-two specimens—in Forward Bay, (eighteen specimens) off False Head, (two specimens) and in Quatsino Sound (two specimens).

This shell has since been obtained by the U.S. Fish Commission in San Pedro Bay.

Mr. Whiteaves has a note on this species and two excellent figures of the largest of Dr. Dawson's specimens, in the "Ottawa Naturalist" for December, 1893 (vol. vii., p. 135).

HALIOTIS, Linne.

321. HALIOTIS KAMTSCHATKANA, Jonas.

Zeitschr. f. Mal., 1845, p. 168.

Not uncommon on boulders at low-water mark on our northern and northwestern coasts. The animal is used as food, by the Indians, and the shell for ornamental purposes. Dr. Pilsbry in his "Manual" places *H. Kamtschatkana* as a variety of *H. gigantea*, Chemnitz (Japan).

PUNCTURELLA, R. T. Lowe.

322. PUNCTURELLA CUCULLATA, Gould, sp.

Rimula cucullata, Gould, Proc. Bost. Soc. Nat. Hist., vol. ii., p. 159 (August, 1846); and U.S. Expl. Exped., Mollusca, p. 368, fig. 475-475c (1852).

323. PUNCTURELLA GALEATA, Gould, sp.

Rimula galeata, Gould, Proc. Bost. Soc. Nat. Hist., vol. ii., p. 159 (August, 1846); and U.S. Expl. Exped., Mollusca, p. 369, pl. xxxi., fig. 476-476a (1852).

324. Puncturella Cooperi, Carpenter.

Rept. Brit. Assoc., 1863, p. 651 (August, 1864); and Proc. Cal. Acad. Sci., vol. iii., p. 214 (1865).

Of our three species of *Puncturella* the two first named seem to be fairly common and they are usually dredged attached to stones or dead shells in ten to thirty or more fathoms.

P. cucullata occurs in two forms, which may possibly prove to be distinct—the one has few and very prominent ribs while in the other the sculpture is closer and much finer.

P. Cooperi is the smallest and rarest of the three, and so far has only been taken in this province, at Departure Bay, where I dredged it in 1888, and again last year, in company with *P. galeata.*

Dr. Pilsbry unites the last named species with the Atlantic *P. noachina*, Linne, sp.

EMARGINULA, Lamarck.

325. Emarginula crassa, J. Sowerby.

Min. Conch., p. 73, pl. xxxiii., upper figures.

The occurrence on our coasts of this rare European shell was hardly expected. The single specimen believed to have been taken at the Queen Charlotte Islands by Dr. Dawson is thus recorded by Mr. Whiteaves in the "Ottawa Naturalist," vol. vii, p. 135: "An adult shell of this species with the animal, was found in a jar containing large specimens of *Solaster Stimpsoni*, *Solaster Dawsoni*, *Cribrella læviuscula* and other starfishes characteristic of the British Columbian marine fauna, preserved in alcohol, the contents of which, except the alcohol, were stated by Dr. Dawson to have been dredged by him at the Queen Charlotte Islands in 1878."

FISSURIDEA, Swainson.

326. Fissuridea aspera, Eschscholtz, sp.

Fissurella aspera, Esch., Zool. Atlas, pt. 5, p. 21, pl. xxiii., fig. 5 (1833).
cratitia, Gould.

Common between tides from Victoria to the Queen Charlotte Islands. A large percentage of the shells of this species are found to contain besides the rightful inhabitant a parasitic annelid—*Lepidonotus Lordi*, Baird. Dr. Newcombe states in his "Catalogue" that he has observed similar worms in the shells of *Puncturella cucullata* and *Acmæa mitra.*

MEGATEBENNUS, Pilsbry.

327. Megatebennus bimaculatus, Dall, sp.

Fissurellidea bimaculata, Dall, Amer. Jour. Conch., vol. vii., p. 132, pl. xv., fig. 7 (November, 1871).

This little shell seems to be very rare in British Columbia. Dr. Dawson dredged two dead specimens in Houston-Stewart channel, Queen Charlotte Islands; Dr. Newcombe found a few specimens living at the roots of *Macrocystis* in Clayoquot Sound; and I have a single dead shell, which I picked up on the beach at Victoria.

POLYPLACOPHORA.

CHITONIDÆ.

The Chitons of the Pacific coast are numerous and very interesting and as a consequence they have received a good deal of attention at the hands of conchologists. Drs. Carpenter, Dall, and Pilsbry, have all written at length upon this subject and it will be sufficient for present purposes for me to refer to their papers[1] and to limit my own remarks to a simple record of the distribution of the various species within our province.

I may say that while there are still some of the smaller forms about which we are in doubt the names of the majority of our Chitons are, I believe, correctly determined. Numerous specimens of all but three of the species admitted to this list are in my own collection.

LEPIDOPLEURUS, Risso.

328. Lepidopleurus cancellatus, Sowerby, sp.

Chiton cancellatus, Sby., Conch. Ill., figs. 104-105 (1839).

This species is of common occurrence under stones between tides and it has also been dredged not unfrequently near Victoria and in Departure Bay, attached to stones and broken pieces of shell. It was also obtained in this way by Dr. Dawson at Alert Bay and Freshwater Bay.

L. cancellatus resembles, very nearly, several other species of the same genus, and I am not quite sure that all our Vancouver specimens really belong to the present species.

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[1] The most important are:

Carpenter; Supplementary Report to the British Association, 1863.

Dall; Report on the Limpets and Chitons of the Alaska and Arctic regions, &c. (See note under *Acmæa patina*.)

Pilsbry; Manual of Conchology, vol. xiv.

The synonymy of our species will be found exhaustively treated in the two last named works.

TRACHYDERMON, Carpenter.

329. Trachydermon dentiens, Gould, sp.

Chiton dentiens, Gould, Proc. Bost. Soc. Nat. Hist., vol. ii., p. 145 (July, 1846); and U.S. Expl. Exped., Mollusca, p. 321, figs. 433-433b (1852).
Trachydermon pseudodentiens, Cpr.

I have a few specimens of this species found on rocks between tides near Victoria. The shell does not seem to have been recognized by Mr. Whiteaves in Dr. Dawson's collections.

330. Trachydermon flectens, Carpenter.

Rept. Brit. Assoc., 1863, p. 649 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 60.

A pretty little species collected here by both Lord and Kennerley (teste Carpenter). I have taken it not rarely, by dredging, at Victoria and Departure Bay; but strangely enough Dr. Dawson did not obtain it during his northern trips, nor has Dr. Newcombe found it in any of the localities in which he has collected.

TONICELLA, Carpenter.

331. Tonicella lineata, Wood, sp.

Chiton lineatus, Wood, Gen: Conch., p. 15, pl. 2, figs. 4-5 (1815).

Very common between tides on all our coasts. It is a very variable species but always readily separable from its allies. A pretty variety, of which I took two or three specimens at Nanaimo last year, is, when alive, wholly bright blue without any trace of the characteristic lineation. Dr. Pilsbry calls this species "One of the handsomest north Pacific Chitons," and so it undoubtedly is.

332. Tonicella submarmorea, Middendorff, sp.

Chiton submarmoreus, Midd., Bull. Acad. Sci. St. Peters., vol. iv., no. 8 (1846); and Mal. Ross., pt. 1, p. 98, no. 4 (1847).

Of this species only a few specimens have so far been taken at Victoria, Departure Bay and Salt Spring Island (G. W. T.) and Galiano Island (Newcombe).

Carpenter placed *T. submarmorea* on our Vancouver list on the strength of specimens collected by Swan, but added a note "perhaps = *lineata* without the lines." It is however easily distinguished from *lineata*, as Pilsbry remarks, by its microscopic granulations, and from the following species, *T. marmorea*, by its different colour pattern.

333. TONICELLA MARMOREA, O. Fabricius, sp.

Chiton marmoreus, O. Fab., Fauna Groenl., p. 420 (1780).

This is a species that I have searched for, so far, in vain. So far as I know it has only been taken in the Pacific Ocean, near the Aleutian Islands (Dall), and at Japan, and by Dr. Dawson in Houston-Stewart Channel, Queen Charlotte Islands (two specimens).

It is a common species on both sides of the Atlantic Ocean.

CYANOPLAX, Pilsbry.

334. CYANOPLAX HARTWEGII, Carpenter, sp.

Chiton Hartwegii, Cpr., Proc. Zool. Soc. London, 1855, p. 231.

335. CYANOPLAX NUTTALLII, Carpenter, sp.

Chiton Nuttallii, Cpr., Proc. Zool. Soc. London, 1855, p. 231.

C. Nuttallii is recorded from Paget Sound (Swan), and *C. Hartwegii* is said to have been found at the Queen Charlotte Islands by Dr. Dawson. Dr. Pilsbry supposes the two to be forms of one species. My own specimens of *C. Hartwegii* (I have not met with the other form) are from Victoria, but they are not any of them quite like the typical Californian ones.[1]

ISCHNOCHITON, Gray.

336. ISCHNOCHITON INTERSTINCTUS, Gould, sp.

Chiton interstinctus, Gould, U. S. Expl. Exped., Mollusca, p. 322, pl. xxvii., figs. 423-423b (1852).

This beautiful little species is very common on stones and dead shells dredged in ten to thirty fathoms, at Victoria, Departure Bay and elsewhere. Dr. Dawson obtained it in Virago Sound and Houston-Stewart Channel, Queen Charlotte Islands, and in many more southerly localities. Occasionally small specimens may be found under stones between tides.

337. ISCHNOCHITON RETEPOROSUS, Carpenter, sp.

Trachydermon retiporosus, Cpr., Rept. Brit. Assoc., 1863, p. 649 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 59.
= *Leptochiton punctatus*, Whiteaves, Trans. Roy. Soc. Can., vol. iv., sect. iv., p. 125, figs. 3 and 4 (1886).

This is usually found in company with the last species and is

[1] Since the above was written, Dr. Pilsbry has described this form, which occurs also in California, as a distinct species under the name *Trachydermon* (*Cyanoplax*) *Raymondi*. Nautilus, vol. viii., p. 46 (August, 1894).

equally abundant. It varies a good deal in colour, as does *I. interstinctus* also, but is usually much darker than that species.

An exceptionally pale specimen was named *Leptochiton punctatus*, by Mr. Whiteaves, under the supposition that it was a new species.

ISCHNORADSIA, Shuttleworth.

338. Ischnoradsia Mertensii, Middendorff, sp.

Chiton Mertensii, Midd., Bull. Acad. Sci. St. Peters., vol. vi., no. 8. p. 118 (April, 1847); and Mal. Ross., pt. 1, p. 125, no. 16, pl. xiv., fig. 1-3 (1847).

This species is found, but not plentifully, in most localities examined from Victoria to the Queen Charlotte Islands.

It is most frequently obtained by dredging, but is sometimes found between tides. Some very large specimens were collected by myself on the rocks at low water at Salt Spring Island.

339. Ischnoradsia trifida, Carpenter, sp.

Trachydermon trifidus, Cpr., Rept. Brit. Assoc., 1863, p. 649 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 60.

The type specimen of this rare species was collected by Dr. Kennerley in Puget Sound. Two specimens were obtained by Dr. Dawson, one at the mouth of Cumshewa Harbour in twenty-nine fathoms, and the other in Queen Charlotte Sound.

Quite lately Dr. Newcombe has found one or two specimens near Victoria. These are all the British Columbian specimens I have heard of, and to the north of us *I. trifida* is equally rare.

NUTTALLINA, Carpenter.

340. Nuttallina scabra, Reeve, sp.

Chiton scabra, Reeve, Conch. Icon., Mon. Chitons, pl. xvii., fig. 106 (1847).

Dr. Kennerley is said to have collected one young living specimen in Puget Sound. Dall gives the distribution of the species as "Vancouver District, south to California, probably in the southern islands of Alaska; at and above high-water mark, in crevices of the rocks; at Monterey abundant."

I have seen numerous Californian specimens but have never found or seen a British Columbian example.

MOPALIA, Gray.

341. Mopalia ciliata, Sowerby, sp.

Chiton ciliatus, Sowerby, Conch. Ill., p. 79, 1838
= *C. muscosus*, Gould, Proc. Bost. Soc. Nat. Hist., vol. ii., p. 145 (July, 1846); and U. S. Expl. Exped., Mollusca, p. 313, fig. 436 (1852).
var. *Hindsii*, Gray, Proc. Zool. Soc. London, 1847, pp. 69 and 169.

342. MOPALIA LIGNOSA, Gould, sp.

Chiton lignosus, Gould, Proc. Bost. Soc. Nat. Hist., vol. ii., p. 142 (July, 1846); + *C. vespertinus*, Gould.

343. MOPALIA WOSSNESSENSKII, Middendorff, sp.

Chiton Wossnessenskii, Midd., Bull. Acad. Sci. St. Peters., vol. vi., no. 8, p. 119 (April, 1847); and Mal. Ross., pt. 1, p. 101, no. 6, pl. xi., fig. 1-2 (1847).

These three forms are all extremely common on rocks between tide marks all through the province.

As found at Victoria and other localities that I have visited the three are always quite distinct. In fact judging only from specimens in my own collection, I should be inclined to admit at least one other form to specific rank.

Dr. Dall on the other hand after the examination of a multitude of specimens places *lignosa* under *ciliata* as a subspecies, thus reducing our Mopalias to two.

Typical *M. ciliata* were not observed by me at Nanaimo last year, although *lignosa* and *Wossnessenskii* were very numerous; usually *ciliata* is the commonest form.

M. Wossnessenskii is very variable in colour ranging from brown to bright red or still brighter emerald green.

PLACIPHORELLA, Carpenter.

Dall suggests (Proc. U.S. Nat. Mus., 1886, p. 210) that *Placiphorella* be retained for the group of *P. velata*, Cpr., and a new subgenus of *Osteochiton* be formed for *P. sinuata* and *P. imporcata*, but for the present we include our three species under the one generic title.

344. PLACIPHORELLA VELATA, Carpenter.

Not rare in California but only known as British Columbian from one fine specimen found last summer by Professor Macoun, on the rocks at Sooke Harbour, Vancouver Island.

345. PLACIPHORELLA SINUATA, Carpenter.

Mopalia sinuata, Cpr., Rept. Brit. Assoc., 1863, p. 648 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 59.

346. PLACIPHORELLA IMPORCATA, Carpenter.

Mopalia imporcata, Cpr., Rept. Brit. Assoc., 1863, p. 648 (August, 1864); and Proc. Acad. Nat. Sci. Phila., 1865, p. 59.

Neither of the above species are common. The former occurs at Victoria in ten to thirty fathoms, and has also been taken by me in some numbers on rocks at low tide in Departure Bay. *P. imporcata*

occurs with *sinuata* at Victoria and has been dredged at Ganges Harbour and Comox by Dr. Newcombe, and in Forward Bay (a single specimen) by Dr. Dawson.

KATHERINA, Gray.

347. Katherina tunicata, Wood, sp.

Chiton tunicatus, Wood, Gen. Conch., pl. ii., fig. 1 (1815).

This is a most abundant chiton on nearly all parts of our coasts. It occurs on the rocks between tides and is collected for food by the Indians and is occasionally seen exposed for sale in the Victoria fish stores.

The only locality in which I have failed so far to find *K. tunicata*, is Nanaimo. During four days collecting there last July, neither Professor Macoun or myself observed a single specimen; *M. ciliata*, as above noted, was also absent.

CRYPTOCHITON, Middendorff.

348. Cryptochiton Stelleri, Middendorff.

Chiton Stelleri, Midd., Bull. Acad. Sci. St. Peters., vol. vi., no. 8, p. 116 (April, 1847); Mal. Ross., pt. 1, p. 37, 93, no. 1, pl. i. to ix. (1847).

This king among chitons is not uncommon in British Columbia, though by no means so plentiful as some others of our species.

It is usually found in the early spring upon the rocks at low water. A large specimen will measure nearly twelve inches in length.

CEPHALOPODA.

OCTOPUS, Lamarck.

349. Octopus punctatus, Gabb.

Proc. Cal. Acad. Nat. Sci., 1862, p. 170.

Carpenter records this species, with a query, as having been collected in Puget Sound by Kennerley, and in the same neighbourhood by Swan, and I suppose that we are correct in applying the name to the large *Octopus* that abounds near Victoria and which is, with the Indians, a much esteemed article of food.

ONYCHOTEUTHIS, Lichtenstein.

350. Onychoteuthis fusiformis, Gabb.

Proc. Cal. Acad. Nat. Sci., 1862, p. 171.

This like the last species is given by Dr. Carpenter, with a query, as from Puget Sound (Kennerley), and I have a single specimen, which

I suppose to belong to this species, and which I found in a dying condition on the beach at Oak Bay near Victoria.

OMMASTREPHES, D'Orbigny.

351. Ommastrephes sagittatus, Lamarck, sp.

This appears to be the commonest of our Cephalopods. It was first recorded from our province by Mr. Whiteaves who writes that three specimens were taken at low water in Victoria Harbour by Dr. Dawson. There are numerous fine specimens from various British Columbian localities in the Provincial Museum at Victoria.

Of the species above enumerated, the following are of economic importance, being used as food by the Indians, and also, to a less extent, by the Chinese and whites. Most of them, in their proper season, may be seen exposed for sale in the Victoria stores :

Ostrea lurida,
Mytilus Californianus,
Mytilus edulis,
Cardium Nuttalli,
Tapes staminea,
Saxidomus squalidus,
Macoma secta,
Macoma nasuta,
Macoma inquinata,
Tresus Nuttalli,
Mya arenaria,
Haliotis Kamtschatkana,
Katherina tunicata,
Cryptochiton Stelleri,
Octopus punctatus.

Ostræa Virginica is largely imported, but native specimens of this species are much too scarce to be of commercial value.

Many other of our species are edible, and in other countries would be sought after for food, but their value does not seem to have been discovered as yet by the British Columbians.

The larger Pectens (which I know from personal experience to be exceedingly toothsome, *Penitella penita*, *Siliqua patula*, *Zirphœa crispata*, the *Purpuræ*, the *Littorinæ* and the Limpets, will possibly all some day be utilized.

A large number of our British Columbian Mollusca occur also on the "Old Country" coasts.

* *Hemithyris psittacea,*
* *Limatula subauriculata,*
* *Mytilus edulis,*
* *Modiola modiola,*
* *Modiolaria nigra,*
Modiolaria marmorata,
* *Crenella decussata,*
* *Nucula tenuis,*
* *Leda minuta,*
Kellia suborbicularis,
Lasea rubra,
Cryptodon flexuosus,
* *Mya truncata,*
* *Mya arenaria,*
* *Saxicava rugosa,*
* *Panopaea Norvegica,*

* *Zirphaea crispata,*
* *Xlyophaga drosalis,*
Xylotrya bipinnata,
Xylotrya fimbriata,
Cylichna cylindracea,
* *Diaphana pellucida,*
Haminea hydatis,
Bela Trevelyana,
Triforis adversa,
Cerithiopsis tubercularis,
* *Lacuna vincta,*
* *Velutina laevigata,*
* *Margarita helicina,*
Emarginula crassa,
Lepidopleurus cancellatus,
* *Tonicella marmorea.*

Many of our land and freshwater shells are also common to the two continents, and a few species, **Macoma lata*, **Natica clausa*, **Admete Couthouyi*, are found in England in a subfossil condition, though still living in our waters.

The foregoing list may be lengthened if we admit the following identifications :—

BRITISH COLUMBIAN.	BRITISH.
Terebratulina unguicula,	*T. caput-serpentis,*
Lucina acutilineata,	*L. borealis,*
Dentalium indianorum,	*D. entale,*
Bela fidicula,	* *B. turricula,*
Purpura crispata,	* *P. lapillus,*
Eulima micans,	*E. polita,*
Eulima, sp.,	*E. distorta,*
Trichotropis cancellata,	* *T. borealis,*
Littorina sitkana,	* *L. rudis,*
Acmæa patina,	* *A. testudinalis,*
Puncturella galeata.	* *P. Noachina.*

The twenty-eight species in the foregoing lists that are marked with asterisks, and the following fifteen species, are known to occur also on the Atlantic coast of Canada :—

Ostrea Virginica
Modiolaria laevigata,
Yoldia thraciæformis,
Yoldia limatula,
Astarte undata,
Serripes Groenlandicus,
Venericardia borealis (= ? ventricosa),
Bela exarata,
Bela violacea,
Buccinum cyaneum,
Chrysodomus liratus,
Trophon clathratus (=? multicostatus),
Mesalia reticulata,
Alvania castanea,
Solariella varicosa.

III.—*Notes on some of the Cretaceous Fossils collected during Captain Palliser's Explorations in British North America in* 1857-60.

By J. F. WHITEAVES.

(Read May, 1894, but revised to date.)

The present communication is intended as a supplement to a paper published in the eleventh volume of Transactions of this society,[1] in which an attempt was made to give a summary of the present state of our knowledge of the Cretaceous system of Canada, and more especially of that of its fossil flora and fauna.

The Cretaceous fossils collected by Sir James (then Doctor) Hector in Manitoba, the Northwest Territories and British Columbia, during Captain Palliser's explorations, which are of special interest to the student of Canadian geology on account of the early dates at which they were obtained, were referred to in this paper in as much detail as was then practicable, for, at the time when it was written, the writer had never seen any of the specimens themselves. Some of these fossils are still in the Museum of the Geological Society of London, but others have been transferred to the Natural History Department of the British Museum at South Kensington. The whole of those at Burlington House have been kindly forwarded to the writer, for examination and comparison, by the Geological Society, through its president, Dr. Henry Woodward, F.R.S., etc., and it is upon these specimens that the present paper is based, as the rules of the British Museum do not permit of the lending of any of its specimens.

Provisional lists of the fossils collected were contributed by Mr. Robert Etheridge, F.R.S., to Sir James Hector's classical paper "On the Geology of the Country between Lake Superior and the Pacific Ocean," etc., published in the Quarterly Journal of the Geological Society of London for April, 1861, and to Captain Palliser's official report published in 1863.

At the time these lists were prepared, the only illustrated memoirs or papers on the fossils of the Cretaceous rocks of North America that had been published were, Morton's "Synopsis of the Organic Remains of the Cretaceous Group of the United States" (1834), and his descriptions of some new species of organic remains from the same rocks, published in volume viii., part 3 (1842), of the Journal of the Academy of Sciences of Philadelphia, both treating for the most part of fossils from New Jersey; Ferdinand Roemer's "Kreidebildungen von Texas" (1852); D. Dale

[1] "The Cretaceous System in Canada," Trans. Royal Soc. Canada for 1893, vol. xi., sect. 4, pp. 3-19.

Owen's report of a Geological Survey of Wisconsin, Iowa and Minnesota, etc. (1852) ; T. Conrad's palæontological supplement to the first volume of Emory's report on the United States and Mexican Boundary Survey (1857) ; and F. B. Meek's palæontological supplement to Prof. Hind's report on the Assiniboine and Saskatchewan Exploring Expedition (1859).

Mr. Etheridge, naturally and very properly, tried to identify the Cretaceous fossils collected by Sir James Hector, with those species which they most nearly resemble in one or other of these publications. An analysis of his published lists shows that as many as nineteen of these fossils are determined specifically, viz., eleven from Manitoba and the Northwest Territories, and eight additional species from Vancouver Island, but it must also be borne in mind that, of these nineteen, four belong to the genus *Ostrea* and five to *Inoceramus*, both of which are genera in which the species are unusually difficult to discriminate. No less than seven of the species from Manitoba or the Northwest Territories, and seven others from Vancouver Island are referred by Mr. Etheridge to Texan species described and figured by Roemer or Conrad.

The extensive collections made of late years by the officers and employees of the Geological Survey of Canada have, however, conclusively shown that the fossils of the Cretaceous rocks of Manitoba and the Northwest Territories bear a much greater resemblance to those of the Cretaceous rocks of the upper Missouri country as described long ago by Meek and Hayden and more recently illustrated by Meek, than they do to the organic remains of Texas or New Jersey. Several species of fossils, too, from the "Nanaimo group" of the Vancouver Cretaceous have since been described by Meek and other palæontologists, and it has long been known to Canadian geologists that the fauna of this formation is essentially similar to that of the Chico group of the California Cretaceous and by no means so closely analogous to the fauna of the Cretaceous rocks bordering upon the Atlantic or Gulf of Mexico. The fossils collected by Sir James Hector are found to harmonize perfectly with these general conclusions, and in the present state of our knowledge of the fossil fauna of the Canadian Cretaceous it is now feasible to determine the species represented in the collection sent, with a greater degree of accuracy than was possible upwards of thirty years ago.

The specimens which could not be found at Burlington House, and which may have been transferred to the British Museum, and, therefore, could not be forwarded to the writer, are as follows :

All the fossils from Coal Creek (Red Deer River, Alberta), mentioned on page 425 of Sir James Hector's paper, viz. :

Ostrea anomiæformis.
Mytilus (2 species).
Cardium multistriatum,
Crassatella.
Venus.
Rostellaria.
Paludina.

Some of the specimens from the Red Deer River, above the Nick Hills, referred to on page 426 of Sir James Hector's paper as "concretionary masses of limestone, filled with fresh-water shells, such as *Paludina*, *Planorbis*, etc.," and in the first list of specimens on page 244 of Captain Palliser's report as containing shells of "*Paludina*, *Unio*, *Planorbis* and *Cyclas*."[1]

FROM THE ELBOW OF THE SOUTH SASKATCHEWAN.

Astarte Texana, No. 15, and *Cytherea*, No. 16, of the list on page 243 of Captain Palliser's report.

FROM FORKED CREEK AND LONG RIVER, IN THE SOURIS HILLS, MANITOBA.

Leda Hindi, the No. 5 of the list on page 242 of Captain Palliser's report.

FROM VANCOUVER ISLAND.

Inoceramus Texanus, *Inoceramus confertim-annulatus and Ammonites geniculatus*, being Nos. 18, 21 and 28 of the list on page 243 of Captain Palliser's report.

Many of the specimens sent are labelled with two or more numbers, but in the present paper only those will be referred to which obviously correspond to the numbers in the lists of specimens on pages 242-244 of Captain Palliser's report.

It will be convenient to consider these fossils in the following order: A, those from the Laramie formation of Assiniboia and Alberta; B, those from the Pierre-Fox Hills or Montana formation of the Plains; C, those from the disturbed region of the foot-hills and eastern flanks of the Rocky Mountains; and, D, those from the "Nanaimo group" of Vancouver Island.

A.—*From the Laramie of Assiniboia and Alberta.*

OSTREA GLABRA, Meek and Hayden, varieties.

Ostrea glabra, Meek and Hayden. 1857. Proc. Ac. Nat. Sc. Philad., vol. ix., p. 146.
Ostrea cortex, Etheridge. 1861. In Hector's paper, Quart. Jour. Geol. Soc. London, vol. xvii., pp. 418-419, but probably not *O. cortex*, Conrad, 1857.
Ostrea Veleniana, Etheridge. 1863. In Capt. Palliser's Off. Rep., p. 242, No. 2, but not *O. Veleniana*, Conrad, 1857.
Ostrea cortex, Etheridge. 1863. *Ib.*, p. 243, Nos. 119, and 30.
Ostrea Wyomingensis, Meek. 1873. Rep. U. S. Geol. Surv. Terr. for 1872, and illustrated by Dr. C. A. White in 1880, on pl. 20 of U. S. Geol. Surv. Terr., Contr. to Pal., Nos. 2-8.

[1] Two small pieces of limestone were sent from this locality. One of these contains a few specimens of a shell which appears to be *Campeloma productum*, White, and the other, two badly preserved casts of the interior of a species of *Viviparus*.

Ostrea glabra, Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 521, pl. 40, figs. 6, *a-c*.

" " White. 1883. Rev. Non-Marine Foss. Mollusc. North America, pls. 9, 10 and 11.

West flank of Cypress Mountain (Assiniboia), July, 1859: three specimens of the thin-shelled, comparatively smooth, typical form of *O. glabra*, with small ligamentary area, and labelled No. 2, *Ostrea Veleniana*.

"Red Deer River" (Alberta), "southwest of the Hand Hills, and over the Lignite, Dr. Hector, June, 1859": four specimens of the variety *Wyomingensis*, labelled No. 30, *Ostrea cortex*, two with high ligamentary areas.

Battle River (Alberta), above the Elbow, July, 1858: two specimens (one labelled *O. cortex*) with a very high ligamentary area, and certainly very closely resembling *O. cortex*, Conrad.

Corbicula occidentalis, Meek and Hayden.

Cyrena occidentalis, Meek and Hayden. 1856. Proc. Ac. Nat. Sc. Philad., vol. viii., p. 116.

Cardium multistriatum, Etheridge. 1861. In Hector's paper in the Quart. Journ. Geol. Soc. Lond., vol. xviii., p. 425, but not *C. multistriatum*, Schumacher.

" " Etheridge. 1863. No. 35 of the list on p. 243 of Capt. Palliser's Report.

Corbicula occidentalis, Meek. 1869. Proc. Ac. Nat. Sc. Philad., vol. xii., p. 432.

" " G. M. Dawson. 1875. Rep. Geol. & Resourc. Reg. in vic. of 40th Par., p. 133.

" " Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 521, pl. 40, figs. 6, *a-c*.

" " White. 1880. U. S. Geol. Surv., Contr. to Pal., Nos. 2-8, p. 75, pl. 21, figs. 3, *a-c*.

" " White. 1883. Rev. Non-Marine Foss. Moll. N. Amer., p. 31, pl. 17, figs. 6, 7, and pl. 23, figs. 1-6.

" " Whiteaves. 1885. Contr. to Canad. Palæont., vol. i., pt. 1, p. 7, pl. 1, figs. 3 and 3 *a*.

"Red Deer River, southwest of the Hand Hills and over the Lignite, Dr. Hector, June, 1859": a small piece of argillaceous limestone, with an imperfect cast of the interior of a right valve of this species, two valves of *Corbula subtrigonalis* and a few characteristic examples of its variety *perundata*. The specimen is labelled "*Cardium multistriatum*, Schum., and *Venus*," but without number, though it probably corresponds to Nos. 35, 36 and 37 of the list of specimens on page 243 of Captain Palliser's report.

CORBULA SUBTRIGONALIS, Meek and Hayden.

Corbula subtrigonalis, Meek and Hayden. 1856. Proc. Ac. Nat. Sc. Philad., vol. viii., p. 116.
" " Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 529, pl. 40, figs. 3, *a-b*.
" " White. 1880. U.S. Geol. Surv., Contr. to Pal., Nos. 2-8, p. 80.
" " White. 1883. Rev. Non-Marine Foss. Moll. N. Amer., p. 36, pl. 19, figs. 10-15.
" " Whiteaves. 1885. Contr. to Canad. Palæont., vol. i, pt. 1, p. 62.

On the same small piece of rock as the preceding species: one full-sized right valve and a small left valve.

CORBULA SUBTRIGONALIS, var. PERUNDATA.

Corbula perundata, Meek and Hayden. 1856. Proc. Ac. Nat. Sc. Philad., vol. viii., p. 116.
" " Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 530, pl. 40, figs. 4, *a-d*.
Corbula subtrigonalis, var. *perundata*, White. 1883. Rev. Non-Marine Foss. Moll. N. Amer., p. 36, pl. 19, figs. 16 and 17.
Corbula perundata, Whiteaves. 1885. Contr. to Canad. Palæont., vol. i., pt. 1, p. 69.

With the two preceding species. This shell could very well be No. 36 of the list on page 243 of Captain Palliser's report, as it has much the aspect of a small *Crassatella*. A small *Corbula* from the Laramie of Wyoming, which Dr. C. A. White regards as one of the forms of *C. subtrigonalis*, has indeed been called *C. crassatelliformis* by Meek.

B.—*From the Pierre-Fox Hills or Montana formation of the Plains.*

PECTEN, or SPONDYLUS, Sp.

Ostrea lugubris, Etheridge. 1861. In Hector's paper in the Quart. Journ. Geol. Soc. Lond., vol. xvii., p. 415, but apparently not *O. lugubris*, Conrad, 1857.
" " Etheridge. 1863. No. 8 of the list on page 242 of Capt. Palliser's report.

A specimen labelled "No. 8, Cretaceous shale of Long River and Forked Creek, Souris Hills" (Manitoba), "*Ostrea lugubris*, Dr. Hector, 1857," is a cast of the interior of one valve of a small bivalve, a little more than three millimetres in height, and slightly less than that in length. It is moderately convex, symmetrical, and nearly circular in outline, with a flattened central beak, which is sharply angulated on both sides, and a surface marked with radiating ribs of unequal size. It is scarcely possible to determine to what genus this specimen should be referred, but it gives one the impression of being, perhaps, the cast of a valve of a very young shell of a species of *Pecten* or *Spondylus*, rather than that of a young *Ostrea* or *Anomia*.

Pteria linguiformis, Evans and Shumard.

Avicula linguiformis, Evans and Shumard, 1854. Proc. Ac. Nat. Sc. Philad., vol. ii., p. 163.
" " Meek. 1859. In Hind's Rep. Assinib. and Saskatch. Expl. Expd., Toronto, p. 183, pl. 1, fig. 6.
Pteria linguiformis, Meek, 1876. Rep. U.S. Geol. Surv. Terr., vol. ix., p. 32, pl. 16, figs. 1, *a-d*.
" " Whiteaves. 1885. Contr. to Canad. Palæont., vol. i., pt. 1, p. 31.

"Battle River" (Alberta), "near the Elbow," July, 1858: two good specimens of the left valve of shells of this species. These are both labelled "*Avicula*," but without number, and are evidently the specimens referred to under that name on page 419 of Sir James Hector's paper in the seventeenth volume of Proceedings of the Geological Society of London. It is possible also that they may be the specimens from "Bath" (a typographical error for Battle) "River, near the Elbow," referred to on page 243 of Captain Palliser's official report as "No. 101, *Auricula rubrascensis*," an obvious misprint for *Avicula* (now called *Pteria*) *Nebrascensis*, as neither it nor *P. linguiformis* had then been figured.

Inoceramus Crippsii? var. Barabini.

Inoceramus cuneatus, Meek and Hayden. 1860. Proc. Ac. Nat. Sc. Philad., vol. vii., p. 181.
Inoceramus Crippsii? var. *Barabini*, Meek. 1876. Rep. U.S. Geol. Surv. Terr., vol. ix., p. 49, pl. 12, fig. 3, and pl. 13, figs. 1, *a-c*.
Inoceramus Barabini, Whitfield. 1877. Pal. Black Hills, Dakota, p. 398, pl. 7, fig. 7, and pl. 9, fig. 8.
" " Whiteaves. 1885. Contr. to Canad. Palæont., vol. i., pt. 1, p. 33.

"Elbow of South Saskatchewan," Assiniboia, September 20th to 30th, 1857: three small and very imperfect specimens, the largest about three-quarters of an inch in length and not quite half an inch in maximum height, one labelled "No. 13, *Cardium*," and the other two "No. 14, *Exogyra*," which are somewhat doubtfully referred to this supposed variety of *I. Crippsii*. Two adult and much more perfect examples of a shell, which seem to the writer to agree very well with Meek's description and figures of the western form which he calls *I. Crippsii* var. *Barabini*, were collected by Professor Macoun at the Elbow of the South Saskatchewan in 1879.

Nucula. (Species undeterminable.)

"Battle River," near the Elbow, July, 1858: a cast of the interior of a right valve, on a small piece of rock, associated with one example of *Protocardia subquadrata*, and an imperfect valve of a concentrically ribbed *Mactra* or *Callista*.

The specimen is labelled "*Cytherea*," but without number, and may correspond to Nos. 118, "*Cardium;*" 112, "*Venus (Cytherea ?);*" and 108, "*Nucula*,"—of the list on page 243 of Captain Palliser's report.

LUCINA OCCIDENTALIS, Morton. (Sp.)

Tellina occidentalis, Morton. 1842. Jour. Ac. Nat. Sc. Philad., vol. viii., p. 210, pl. 11, fig. 3.
Lucina occidentalis, Meek and Hayden. 1856. Proc. Ac. Nat. Sc. Philad., vol. viii., p. 272.
" " Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 134, pl. 17, figs. 4, *a-d*.
" " Whiteaves. 1885. Contr. to Canad. Palæont., vol. i., pt. 1, p. 39.

Elbow of the South Saskatchewan, September, 1857: a very imperfect specimen, but with a large portion of the thick test preserved on each valve, so that the outline of the shell can be inferred from the lines of growth. In addition to the locality, the specimen is labelled "No. 12, *Pholadomya occidentalis*, Morton," probably by mistake, as it is clearly not a *Pholadomya*, nor even at all closely related to that genus.

CYPRINA OVATA, Meek and Hayden.

Cyprina ovata, Meek and Hayden. 1857. Proc. Ac. Nat. Sc. Philad., vol. ix., p. 144.
Cytherea Texana, Etheridge. 1861. In Hector's paper, Quart. Journ. Geol. Soc. Lond., vol. xxii., p. 424, but not *C. Texana*, Conrad, 1857.
" " Etheridge. 1863. No. 33 of the list of specimens on page 243 Captain Palliser's Off. Report.
Cyprina ovata, Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 149, fig. 8, and pl. 29, figs. 7, *-a-c*.
" " Whiteaves. 1885. Contr. to Canad. Palæont., vol. 1, pt. 1, p. 40.

Red Deer River, southwest of the Hand Hills, Dr. Hector, June, 1859: three characteristic specimens, labelled "No. 33, Red Deer River—Hand Hills (over the Lignite), Dr. Hector, 1859."

PROTOCARDIA SUBQUADRATA, Evans and Shumard. (Sp.)

Cardium subquadratum, Evans and Shumard. 1857. Trans. Ac. Nat. Sc. St. Louis, vol. i., p. 39.
Protocardia (Leptocardia) subquadrata, Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 175, pl. 29, figs. 8, *a-e*.
Protocardia subquadrata, Whiteaves. 1885. Contr. to Canad. Palæont., vol. i., pt. 1, p. 41, pl. 5, figs. 4 and 4 *a*.

Battle River, near the Elbow, July, 1858: a single specimen, with both valves preserved, on the same piece of rock as the "*Nucula*" referred to on the preceding page.

Liopistha undata, Meek and Hayden.

Pholadomga undata, Meek and Hayden. 1856. Proc. Ac. Nat. Sc. Philadelphia, vol. viii., p. 81.
Liopistha (Cymella) undata, Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 236, pl. 39, figs. 1, *a-b*.
" " " Whiteaves. 1885. Contr. to Canad. Palæont., vol. i., pt. 1. p. 43, and pt. 2, p. 178.

A small piece of an ironstone concretion in the collection has a nearly perfect and well-preserved example of *Liopistha undata*, with the valves spread out, on one side, and a fragment of *Baculites compressus* on the other. The specimen is not numbered, but labelled, "*Baculites compressus*, Red Deer River and Battle River, at the Elbow." It is probably the "Baculites" from the Battle River locality referred to as No. 112 in the list of specimens on page 243 of Captain Palliser's report, as the name of that genus is not included in the list of specimens from the Red Deer River, on the same page.

Cinulia concinna, Hall and Meek.

Actæon concinnus, Hall and Meek. 1854. Mem. Ac. Arts & Sc., Boston, vol., v. n. ser., p. 390, pl. 3, fig. 4.
Avellana subglobosa, Meek and Hayden. 1856. Proc. Ac. Nat. Sc. Philad., vol. viii., p. 64.
Avellana concinna, Meek. 1859. Hind's Rep. Saskatch. and Assinib. Expl. Expd., Toronto, p. 184.
Cinulia concinna, Meek and Hayden. 1860. Proc. Ac. Nat. Sc. Philad., vol. xii., p. 425.
Cinulia (Oligoptycha) concinna, Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 284, pl. 31, figs. 6 *bis*, *a*, *b*, *c*.
Cinulia concinna, Whiteaves. 1885. Contr. to Canad. Pal., vol. i., pt. 1, p. 46.

"Elbow of the South Saskatchewan," Assiniboia, September, 1857: a mould of the exterior of a shell of this species in a small piece of indurated clay. In addition to the locality quoted, the specimen is labelled "No. 13," which number refers to a specimen designated as "Cardium? sp.," in the list on page 242 of Captain Palliser's report. Besides the *Cinulia*, however, the only fossils apparent on this piece of argillaceous rock are a fragment of an *Anisomyon*, and an imperfect right valve of a very small *Inoceramus*, apparently a young shell of the western *Inoceramus*, usually referred to *I. Crippsii*, var. *Barabini*. *Cinulia concinna* has since been collected, in good condition, at the Elbow of the South Saskatchewan by Professor Macoun in 1879.

Lunatia concinna? Hall and Meek.

Natica concinna, Hall and Meek. 1856. Mem. Am. Ac. Arts and Sc., Boston, vol. v., p. 384, p. 3, figs. 2, *a-d*.
Natica Moreauensis, Meek and Hayden. 1856. Trans. Ac. Nat. Sc. Phil., vol. viii., pp. 64 and 382.

Natica (Lunatia) Moreauensis, Meek and Hayden. 1860. *Ibid.*, vol. xii., p. 422.
Lunatia concinna, Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 341, pl. 32, figs. 11 *a*, *b*, *c*.
" " Whiteaves. 1885. Contr. to Canad. Pal., vol. 1, pt. 1, p. 48.

"Red Deer River, southwest of the Hand Hills, Dr. Hector, June, 1859": eleven specimens, each numbered 38, and evidently corresponding to that number on page 243 of Captain Palliser's report. The specimens are either mere casts of the interior of the shell, or casts with part of the exfoliated test adherent thereto, so that their identity with *L. concinna* is not quite certain, though it is highly probable.

Baculites compressus, Say.

Baculites compressus, Say. 1821. Am. Journ. Sc. and Arts, vol. ii., p. 41; also of subsequent writers in the United States and Canada.
" " Etheridge. 1861. In Hector's paper, Quart. Journ. Geol. Soc. Lond., vol. xvii., p. 415.
" " Etheridge. 1863. No. 10 of the list on p. 242 of Capt. Palliser's Rep.

Twenty-three specimens of *Baculites* in the collection, most of them mere fragments, are labelled "No. 10, *Baculites compressus*, Elbow of S. Saskatchewan." Nineteen of these are fairly typical *B. compressus*, but three fragments appear to the writer to be probably referable to *B. ovatus*, though they are too waterworn to be identified with much certainty. One specimen, a piece of a body-chamber nearly four inches long, labelled on one side, "Elbow of S. Saskatchewan," and on the other, "Picked up in the bed of the river above Fort Pitt," seems to be intermediate in its characters between *B. compressus* and *B. ovatus*.

Battle River, at the Elbow, the fragment referred to under the heading *Liopistha undata*.

Baculites ovatus, Say.

Baculites ovatus, Say. 1821. Am. Journ. Sc. and Arts, vol. ii., p. 41; and of subsequent American authors.

Elbow of South Saskatchewan, the three fragments referred to in the remarks upon the preceding species. One of the three is labelled also, "Fort Pitt, from bed of river."

In addition to these species, there are in the collection three specimens of fossiliferous Cretaceous shale from Long River and Forked Creek, in the Souris Hills, Manitoba, two labelled No. 6, and one No. 7. As indicated by Mr. Etheridge, there are "scales of ctenoid fishes" upon both specimens labelled No. 6, and a fragment of an "annelid tube" upon the specimen labelled No. 7.

C.—*From the Cretaceous rocks of the disturbed region of the Foot-Hills and eastern flanks of the Rocky Mountains.*

OSTREA.

Six specimens of the "Ostrea shales" from Bighorn Creek, on the North Saskatchewan, between the Foot-Hills and the Rocky Mountains, collected by Sir James Hector in September, 1858, have their surfaces sparingly strewn with valves of a small *Ostrea*, but only one of these valves is sufficiently perfect and well preserved to show its characters at all clearly. It is a lower valve, a little more than half an inch in its maximum diameter, with only the inner surface exposed, the exterior of its test being completely buried in the matrix. This valve is similar in size and outline to some of the specimens of *O. congesta* (Conrad) figured by Meek on plate 9 of the ninth volume of Reports of the United States Geological Survey of the Territories, but it shows no trace of attachment on its under surface. These pieces of *Ostrea* shale are evidently those referred to on page 243 of Capt. Palliser's report, in the first entry under the heading "Incertæ sedis."

CARDIUM.

Six specimens in the collection, labelled "Cardium shales, Old Bow Fort," contain numerous imperfect casts of the interior and moulds of the exterior of the shell of a small species of *Cardium*, whose specific relations are uncertain. All that these casts or moulds show is that the shell is rather strongly convex, obliquely subovate in outline, and that its whole surface is marked with somewhat coarse radiating ribs. None are sufficiently perfect to admit of a satisfactory comparison between them and such forms as the *Cardium* (*Criocardium*) *speciosum* of Meek and Hayden, from the Fox Hills group of Montana and Colorado, and the *Cardium Kansaense* of Meek, from the Dakota group of Kansas.

Old Bow Fort is on the Bow River, in the Foot-hills of Alberta, and the six specimens now under consideration were collected in 1858, and correspond to the first entry in the list of specimens on page 244 of Capt. Palliser's report. They are also the specimens referred to on page 242 of that report as "nodules of ironstone from septaria clays occurring on Bow River, ten miles below the Old Fort." They contain obscure Cretaceous fossils.

D.—*From the Nanaimo group of Vancouver Island.*

OSTREA OR SPONDYLUS. (Species undeterminable.)

Ostrea bella, Etheridge. 1863. No. 44 of the list of specimens on p. 242 of Capt. Palliser's Rep., but probably not *O. bella*, Conrad, 1857.

A small piece of glauconitic rock labelled "No. 48 (below the Lignite), Departure Bay, Nanaimo; *Ostrea bella*, Conrad; Dr. Hector, 1860;

coll., Mr. Mackay,"—contains a few valves or fragments of valves of a species of *Ostrea*, and a single valve of a shell whose generic and specific relations are uncertain. This valve is sixteen lines and a-half in length and about fourteen and a-half in breadth. It is moderately convex, but with a rather broad, shallow, transverse constriction a little in front of the mid-length, obliquely subovate in outline, a little longer than broad, and the extremely thin test is marked with fine radiating raised lines, about three in the breadth of a millimetre, which are minutely bifurcating anteriorly, when viewed with a lens. It is much more finely ribbed than the convex valve of *Ostrea bella*, if Conrad's figures are correct, and indeed its surface markings are not at all like those of an *Ostrea*. A fragment of a much larger specimen in the collection, from the same locality and apparently belonging to the same species, has essentially the same sculpure on the *interior* of the shell as the *Spondylus complanatus* of D'Orbigny,[1] from the French Neocomien. Another specimen in the collection, from the same locality and possibly also belonging to the same species, is the No. 41 of the list of specimens on page 243 of Capt. Palliser's report. It is a rough cast of the interior of one valve, about two inches and a-quarter in length and an inch and a-half in its greatest breadth. It is longitudinally subovate, but rather irregular in outline, its umbonal region is prominent, and its surface shows impressions of somewhat narrow, flexous, radiating ribs.

INOCERAMUS VANCOUVERENSIS, Shumard.

Inoceramus Vancouverensis, Shumard. 1858. Trans. Ac. Sc. St. Louis, vol. i., p. 123.
Inoceramus unduloplicatus, Etheridge. 1861. In Hector's paper, Quart. Jour. Geol. Soc. Lond., vol. xvii., p. 434, but not *I. undulato-plicatus*, Roemer, 1852.
Inoceramus mytiloides, Etheridge. 1861. *Ib.*, p. 34, but not *I. mytiloides*, Mantell, 1852.
Inoceramus Vancouverensis, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 170, pl. 20, figs. 4, 4 *a* and *b*.
Inoceramus Nebrascensis, var. *Sagensis*, Whiteaves. 1879. *Ib.*, p. 172. (A typ. err. for *I. Sagensis*, var. *Nebrascensis*.)

It is notoriously difficult to differentiate species in the genus *Inoceramus*, partly because the specimens usually obtained are so imperfect or badly preserved, and partly because they are so variable in form and sculpture. No less than seven species have been identified or described by different writers as occurring in the Cretaceous rocks of Vancouver and the adjacent islands, viz., *I. Vancouverensis*, Shumard, *I. subundatus*, Meek, and the forms referred by Etheridge to *I. Crippsii* of Roemer and Conrad, *I. Texanus*, Conrad, *I. Nebrascensis*, Owen, *I. undulato-plicatus*, Roemer, and *I. mytiloides*, Roemer. This number is probably too large,

[1] Paléontologie Française, Terr. Crét., vol. iii., p. 657, pl. 451, figs. 7-10.

but it would seem that Dr. C. A. White goes to the opposite extreme when he maintains that there are only two species in the Nanaimo group, viz., the form with divaricating plications which the writer formerly referred to *I. undulato-plicatus*, and *I. Vancouverensis*. Thus, the species last named appears to be sufficiently distinct from *I. subundatus*, though the latter may be only a variety of the *I. Crippsii* of European authors, as suggested by Meek.

In the collection now under consideration there are three specimens which are apparently referable to *I. Vancouverensis*. One of these is a very imperfect left valve labelled "No. 20, *Inoceramus undulato-plicatus*, septarian clay (above lignite), Nanaimo River, Dr. Hector, 1860." The umbo of this valve is not so tumid as is usual in this species, and the surface markings consist of low, distant, concentric undulations, but there are no indications of any radiating and divaricating folds. The other two are very small right valves from essentially the same locality, one labelled "No. 22, *Inoceramus mytilopsis*," and the other "*Isocardium*." Both have the prominent umbo characteristic of *I. Vancouverensis*, and the latter evidently corresponds to the latter part of the entry, "Also *Nautilus* and *Incardium*" (a typographical error for *Isocardium*), after No. 29 in the list of specimens on page 243 of Captain Palliser's report.

The right valve from the Sucia Islands referred to *I. Sagensis*, var. *Nebrascensis*, on page 172 of the second part of the first volume of "Mesozoic Fossils," is a broad variety of *I. Vancouverensis*.

Inoceramus subundatus, Meek.

Inoceramus subundatus, Meek. 1861. Proc. Ac. Nat. Sc. Philad., vol. xiii., p. 315.

Inoceramus Whitneyi, Gabb. 1869. Geol. Surv. Calif., Palæont., vol. ii.. p. 193, pl. 32, fig. 91.

Inoceramus Crippsii? var. *subundatus*, Meek. 1876. Bull. Geol. and Geogr. Surv. Terr., vol. ii., No. 4, p. 358, pl. 3, figs 1, 1*a*, and 3, 3*a*.

Inoceramus Crippsii, var. *proximus*, Whiteaves. 1879. Geol. Surv. Canada, Mesoz., Foss., vol. i., pt. 2, p. 172.

" " var. *Suciensis*, Whiteaves. 1879. *Ib.*, p. 173.

" " var. *Barabini*, Whiteaves. 1879. *Ib.*, p. 173.

Four small slabs of argillaceous shale from the "Nanaimo River," four labelled "Stewart's Bank," and one "Fossil or Pemberton Bank," have upon one or both sides numerous small valves, which correspond very well with Meek's illustrations of *I. subundatus*. These valves are all obliquely subovate in outline and a little longer than high. Their beaks are very small and scarcely project above the hinge-line. The maximum length of the largest of these valves is very little more than an inch.

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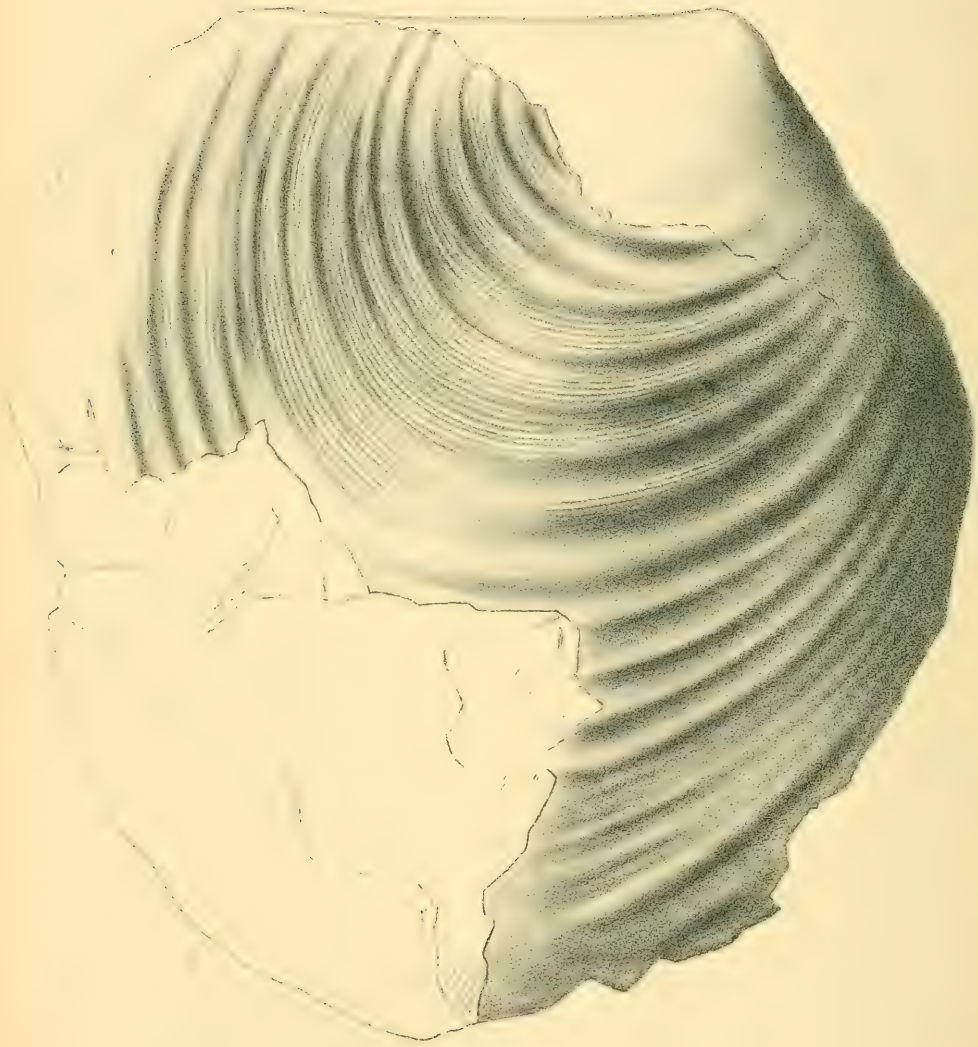

Two-thirds nat. size.

To Illustrate Mr. Whiteaves's Paper.

L. M. LAMBE, F.G.S., DEL. O. E. PRUD'HOMME, LITH.

INOCERAMUS. (Species uncertain.)

Plate I.

In addition to the foregoing, there are in the collection four specimens which the writer is unable to identify, but which are probably referable to one species of *Inoceramus*. All four are very imperfect, but the least so is a specimen about eight inches in its maximum height and not quite seven in length, labelled "No. 19, *Inoceramus Nebrascensis*, Comox, Vancouver's Island, and Nanaimo River, Dr. Hector, collected by Mr. Mackay." This specimen, which is represented two-thirds the natural size on Plate I., is compressed convex, and quite as much compressed proportionately upon the umbones as upon any other part of the shell. Its anterior side is very short and comparatively narrow. Its posterior side, which is much expanded vertically, both above and below, is highest behind the midlength, and subtruncated above. Its hinge-line is rather long, and its sculpture consists of low but distinct and regularly arranged concentric undulations or plications, and close-set and nearly equidistant incremental striæ. Most of the nacreous layer of the test is preserved on the right valve of this specimen, but on and around the umbo and beak the whole of the test is worn away. In the part upon which the test is preserved, about twenty concentric undulations can be counted. The general outline of this specimen is not very unlike that of three very large examples of *Inoceramus Sagensis*, var. *Nebrascensis*, from the South Saskatchewan River, opposite Swift Current Creek, in the Museum of the Geological Survey of Canada, but in each of these the umbones are very tumid and the concentric undulations distant, irregularly disposed and almost obsolete.

Two other specimens from the same locality are labelled "*Inoceramus Crippsii*," and the more perfect of these is the No. 17 of the list of specimens on page 242 of Capt. Palliser's report. It is a large and well-preserved left valve, with about one-third broken off at the posterior end. It has much the same shape and style of sculpture as the specimen labelled *Inoceramus Nebrascensis*, but the concentric plications of the former (which are twenty-eight in number) are more prominent and acute in the umbonal region, where they are crossed by numerous fine radiating linear ridges. The fourth specimen is very imperfect, and its surface markings are almost obliterated by weathering.

ARCA VANCOUVERENSIS, Meek.

Arca Vancouverensis, Meek. 1857. Trans. Albany Inst., vol. iv., p. 40.
Grammatodon? Vancouverensis, Meek. 1876. Bull. U. S. Geol. and Geogr. Surv. Terr., vol. ii., No. 4, p. 356, pl. 3, figs. 5 and 5*a*.

One small but characteristic example, thirteen millimetres and a-half, or a little more than half an inch, in maximum length, labelled "No. 43,

Arca (below the Lignite), Departure Bay, Nanaimo, Dr. Hector, 1860; coll. by Mr. Mackay." A specimen from the same locality, labelled No. 45, is a cast of the interior of both valves of a shell which may be referable to this species, but which has unusually tumid or ventricose umbones. A second specimen from the same locality (the No. 47 of the list of specimens on page 243 of Capt. Palliser's report), although labelled "*Exogyra?* sp.," seems to the writer to be a distorted left valve of a shell which is essentially the same as the specimen labelled No. 45. A third specimen is a coarse cast of a left valve of a species of *Arca*, which is too imperfect for identification.

In the above synonymy the name "*Nemodon Vancouverensis*" (nobis) is omitted, as the writer is not satisfied that the large shells referred to on page 163 and figured on plate 19 of the second part of the first volume of "Mesozoic Fossils," are the adult state of *A. Vancouverensis*, as was then supposed.

Trigonia Evansana, Meek.

Trigonia Evansana, Meek. 1857. Trans. Albany Inst., vol. iv., p. 42.
Trigonia Emoryi, Etheridge. 1861. In Hector's paper, Quart. Jour. Geol. Soc. Lond., vol. xvii., p. 432, but not *T. Emoryi*, Conrad, 1857.
" " Etheridge, 1863. No. 40 of the list of specimens on p. 243 of Capt. Palliser's report.
Trigonia Evansii, Gabb. 1864. Geol. Surv. Calif., Palæont., vol. i., p. 189, pl. 25, fig. 17.
Trigonia Evansi, Meek. 1876. Bull. U. S. Geol. and Geogr. Surv. Terr., vol. ii., no. 4, p. 359, pl. 2, figs. 7, 7*a* and 7 *b*.
Trigonia Evansana, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 161.

Ten specimens, mostly mere casts of the interior of single valves, each labelled "No. 40, *Trigonia Emoryi*, Conrad; below the lignite, Departure Bay, Nanaimo, Dr. Hector, 1860; collected by Mr. Mackay."

In 1876 (*op. cit.*, p. 360) Mr. Meek pointed out that his *T. Evansii* "is almost certainly the same shell that was referred by Mr. Etheridge, among Mr. Hector's collections from Nanaimo, to *T. Emoryi*, Conrad (pl. iii., fig. 2 *a*, *b*, *c*, United States and Mexico Boundary Survey Report)." "It is, however," he says, "certainly very distinct from that species, not only in form and in its decidedly less crenate costæ, but more particularly in having a smooth, longitudinally sulcate, depressed ridge on each side of its escutcheon, not crossed by the costæ. Its costæ are likewise less numerous and more prominent."

Cytherea nitida, Gabb. (Sp.)

Cytherea Leonensis, Etheridge. 1861. In Hector's paper in the Quart. Journ. Geol. Soc. Lond., vol. xvii., p. 432, but not *C. Leonensis*, Conrad, 1859.
Cytherea Conensis (err. typ. for *Leonensis*), Etheridge. 1863. No. 42 of the list of specimens on p. 243 of Capt. Palliser's report.

Venus (Mercenaria ?) varians, Gabb. 1864. Geol. Surv. Calif., Palæont., vol. i., p. 161, pl. 23, figs. 140, 140*a* and 141.
Meretrix nitida, Gabb. 1864. *Ib.*, p. 165, pl. 23, fig. 147.
Caryatis nitida, Gabb. 1869. Geol. Surv. Calif., Palæont., vol. ii., pp. 186 and 240.
Chione varians, Gabb. 1869. *Ib.*, p. 239.
Cytherea (Caryatis) plana, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss. vol. i., pt. 2, pl. 17, figs. 14, 14 *a*, *b*, but probably not *Venus planus*, Sowerby, 1812.

Ten rough casts of the interior of single valves of this species, each labelled "No. 42, *Cytherea Leonensis* (below the lignite), Departure Bay, Nanaimo, Dr. Hector, 1860, collected by Mr. Mackay." Some of them are much distorted, and none of them show the imprint or impress of the pallial line. They correspond to the typical form of *Chione varians*, in which the length of the valves is greater than their height.

Mr. Gabb admits that "there is a great resemblance" . . . "in general shape" between his *Caryatis nitida* and *Chione varians*, but claims that the former can at once be distinguished from the latter by its "smaller size, polished surface, fewer and less distinct lines of growth, and the presence of the deeply impressed lunule." A comparison of a number of specimens of both these forms from the Chico group at several localities in California, kindly forwarded by Mr. T. Stanton, and from the Nanaimo group of Vancouver and the adjacent islands, has convinced the writer that these characters are inconstant and altogether insufficient to warrant their specific separation, and Mr. Stanton writes that he had previously come to the same conclusion.

The specific term *nitida* is here used in preference to *varians*, as the latter name is preoccupied by a recent shell, the *Cytherea varians* of Hanley, the *Caryatis varians* of the catalogue of the shell collection of F. Paetel.

THRACIA (?) SUBTRUNCATA, Meek.

Thracia (?) subtruncata, Meek. 1857. Trans. Albany Inst., vol. iv., p. 44.
" " Meek. 1876. Bull. U. S. Geol. and Geogr. Surv. Terr., vol. ii., no. 4, p. 363, pl. 2, figs. 4 and 4 *a*.
" " Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss. vol. i., pt. 2, p. 140, pl. 17, fig. 7.

Three imperfect and badly preserved specimens, each labelled "No. 46, *Psammobia* (*?*), sp., below the lignite, Departure Bay, Nanaimo, Dr. Hector, 1860, collected by Mr. Mackay," are doubtfully referred to this species.

NAUTILUS. (Species indeterminable.)

A single crushed and distorted specimen, not quite three inches in its maximum diameter, is labelled "Nautilus, Stewart's Bank, Nanaimo River." Its siphuncle is nowhere visible, but a large piece of the test is preserved on one side, near the aperture. The surface is almost smooth

and marked only with fine transverse striæ of growth, while the umbilicus is nearly if not quite closed.

So far, only two species of *Nautilus* have been described from the Vancouver Cretaceous, viz., *N. Campbelli*, Meek, and *N. Suciensis*, mihi. The character mainly relied upon for the separation of these two forms is the different position of the siphuncle in each, for the surface markings of *N. Campbelli* are still unknown, and *N. Suciensis*, although transversely ribbed in the adult state, is almost smooth when half-grown.

Baculites Chicoensis, Trask.

Baculites Chicoensis, Trask. 1856. Proc. Calif. Acad. Nat. Sc., p. 85, pl. 2, fig. 2.
Baculites compressus, Etheridge (Pars.). 1861 (April). In Sir James Hector's paper in Quart. Journ. Geol. Soc. Lond., vol. xvii., p. 434.
Baculites inornatus, Meek. 1891 (October). Proc. Ac. Nat. Sc. Philad., vol. xii., p. 316.
Baculites compressus, Etheridge. 1863. No. 25 of the list of specimens on p. 243 of Capt. Palliser's report.
Baculites Chicoensis, Gabb. 1864. Geol. Surv. Calif., Palæont., vol. i., p. 80, pl. 14, figs. 27, 29 and 29*a*, and pl. 17, figs. 27 and 27*a*.
" " Meek. 1876. Bull. U. S. Geol. and Geogr. Surv. Terr., vol. ii., no. 4, p. 364, pl. 4, figs. 2 and 2 *a-c*.
" " Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 144.
" " White. 1889. Bull. U. S. Geol. Surv., no. 51, p. 47.

In the collection there are fourteen specimens of *Baculites*, varying from rather more than an inch to a little over five inches in length. Some of these are labelled "Pemberton's Bank, Nanaimo River," and others "Stewart's Bank, Comox Island, twenty-one miles northwest of Nanaimo." They correspond to the "*Baculites compressus* and two other species" of the list of fossils on page 434 of Sir James Hector's paper, and to Nos. 23, 24 and 25 of the list on page 243 of Captain Palliser's report. One specimen, labelled No. 24, is subovate or elliptically subovate in cross-section, and therefore probably referable to the typical form of *B. Chicoensis*, though its dorso-ventral diameter it so much greater than its maximum breadth that it seems to the writer, as it did to Mr. Etheridge, to be more nearly related to Say's *B. compressus* than to his *B. ovatus*. Four or five are trigonal in outline in cross-section, and correspond to the form for which Meek proposed the name *B. occidentalis*, but most of the specimens are intermediate in character between the typical form and this variety, and in all the dorso-ventral diameter, near the larger end, is much greater than the maximum breadth.

Pachydiscus. (Species uncertain.)

There are only three specimens of *Ammonites* in the collection received, and each of these is very imperfect. The most perfect is a specimen

about six inches and a half in its maximum diameter, labelled "*Ammonites*, Pemberton's Bank" (Nanaimo River). It is septate throughout, but so much of the outer volution is worn away that its original shape is completely destroyed, though the inner volutions are well preserved, and judging by these, the species would seem to be referable to Zittel's genus *Pachydiscus*. It resembles the *Ammonites Newberryanus* of Meek very closely in shape, but differs therefrom in its much fainter, almost obsolete and more distant transverse ribs; also in the absence of the periodic constrictions so characteristic of *A. Newberryanus*. It is, apparently, a much flatter shell than the *Ammonites Suciensis* of Meek (which is clearly a *Pachydiscus*), and has a sutural line more like that of *A. Newberryanus*. Another specimen, labelled "No. 26," is a fragment of the earlier whorls of a round-backed *Ammonite* about an inch in its greatest diameter; and the third, labelled "*Ammonites*, Comox Island," is a rather large but quite worthless waterworn fragment.

Since the foregoing part of this communication was written, the writer has received from Dr. Franz Kossmat a separate copy of his interesting paper "On the importance of the Cretaceous rocks of Southern India in estimating the geographical conditions during later Cretaceous times," published in a recent number of the Journal of the Royal Geological Institute of Vienna.[1] In this paper Dr. Kossmat says that he saw in an old and still unstudied collection of Hector's, in the British Museum, a beautiful specimen of *Ammonites Indra*, Forbes, the typical *Pachydiscus Otacoodensis* (new to North America) of the Arrialoor group, besides others, some of them new species of *Pachydiscus*, and *Baculites occidentalis*, Meek, which is very similar to the Indian *B. vagina*, all from rocks of the age of the Chico group of California or Vancouver Island.

[1] Jahrbuch der k. k. geolog. Reichsanstadt, Wien, 1894, vol. xliv., pt. 3, p. 472.

IV.—*On some Fossils from the Nanaimo group of the Vancouver Cretaceous.*

By J. F. WHITEAVES.

(Read May 23, 1894, but revised to date.)

The present communication consists partly of notes upon some recently received fossil brachiopoda, mollusca and crustacea from the "Nanaimo group," with descriptions of a few species which appear to be new, and partly of a revision of the nomenclature of certain fossils from that formation which have previously been reported upon in the second part of the first volume of "Mesozoic Fossils," published by the Geological Survey of Canada in 1879.

The new material upon which it is based is as follows: (1) The whole of the fossils from the "Nanaimo group" in the Provincial Museum at Victoria, kindly lent to the writer by its curator, Mr. John Fannin, and including a large series of fossils collected by Mr. Walter Harvey, of Comox, in 1892, at Hornby and Denman islands; (2) collections of Cretaceous fossils made by Dr. C. F. Newcombe on the Comox River, V. I., at Hornby Island in 1892, and at the Sucia Islands in 1894, and obligingly forwarded by him; and (3) a small series of Cretaceous fossils collected by Mr. Harvey at Hornby Island in 1894, which have been sent to the writer for identification. The new decapod crustacean which is described but not figured in this paper will probably be illustrated in the fourth and concluding part of the first volume of "Mesozoic Fossils," now in course of preparation.

MOLLUSCOIDEA.

BRACHIOPODA.

RHYNCHONELLA SUCIENSIS. (Sp. nov.)

Plate 3, fig. 1.

Shell moderately convex, subovate, with an apparently feebly developed mesial fold and sinus. Ventral valve a little longer than broad, with a narrow, elongated and nearly straight beak; dorsal valve broader than long, with a comparatively obtuse and incurved beak. Surface markings of both valves consisting of numerous (about twenty-two) narrow, prominent, acute raised ribs, which extend from the beaks to the anterior margin.

Sucia Islands, J. Richardson, 1874, one rather small but perfect speci-

men and two single valves; and Dr. C. F. Newcombe, 1894, six single valves.

MOLLUSCA.

Pelecypoda.

Gryphæa vesicularis, Lamarck.

Ostrea vesicularis, Lamarck. 1806. Ann. Mus., vol. viii., p. 160, pl. 22, fig. 3; and (1819) Hist. An. Sans Verteb., vol. vi., p. 219.

" " Goldfuss. 1826. Petref. Germ., vol. i., p. 23, pl. 81, fig. 2.

" " D'Orbigny, Pal. Franc., Terr. Crétac., vol. iii., p. 742, pl. 487, figs. 1 and 2, but not figs. 6, 8 and 9.

Ostrea convexa, Say. 1820. Am. Journ. Sc. and Arts, vol. ii., p. 42.

Gryphæa convexa, Morton. 1828. Journ. Ac. Nat. Sc. Philad., vol. vi., p. 79, pl. 4, figs. 1 and 2, and pl. 5, figs. 1-3; also (1834) Synops. Org. Rem. Cret. Gr. U. S., p. 53, pl. 4, figs. 1-2.

Gryphæa mutabilis, Morton. 1828. Journ. Ac. Nat. Sc. Philad., vol. vi., p. 81, pl. 4, fig. 3: and (1834) Synops. Org. Rem. Cret. Gr. U. S., p. 53, pl. 4, fig, 3.

Gryphæa vesicularis, Meek. 1876. Rep. U. S. Geol. Surv., Terr., vol. ix., p. 20 (which see, for several European and U. S. synonyms, not included in this list), pl. 11, figs, 2 *a*, *b*, c, and pl. 16, figs. 8, *a-b*.

Howe Sound, Mr. J. Fannin, 1884: one lower valve, about fifty-one millimetres long and fifty-seven broad. It is ovately subtriangular in outline, broader than long, and its posterior side is produced and somewhat pointed below. Nanaimo, V.I., two specimens; one a very gibbous lower valve, sixty-five mm. long and forty-two broad; the other, seventy millimetres in length by forty-nine in breadth, with both valves preserved *in situ*, but with a much less convex lower valve; both of them elongate subovate in marginal outline and almost equilateral. In two of the specimens the lower valve is strongly and regularly convex, but it is not lobed posteriorly by a distinct longitudinal groove or sinus on or near the front margin, in either of the three.

These free and narrowly convex shells look very different to the broad, irregularly subhemispherical specimens, with a broad surface of attachment to the umbo of the lower valve, from the Fort Pierre group of the Dakota Cretaceous, which Mr. Meek referred with some doubt to *O. vesicularis*. Still they correspond fairly well with Goldfuss' description and figures of the typical form of that species, which he calls the "var. *A*.," and describes as "*testa rostrata libera;*" also with Morton's figures of *G. convexa*, Say, and with one of Stoliczka's figures (Cret. Faun. S. India, pl. 42, fig. 4) of *O. vesicularis*.

INOCERAMUS DIGITATUS (Sowerby) Schmidt.

Inoceramus digitatus (Sowerby), Schmidt. 1873. Petref. Kreideform. Insel Sachalin, in Mem. Ac. Imp. des Sc. de St. Petersburg, vol. xix., no. 3, p. 25, pl. 5, figs. 10 and 11, and the whole of pls. 6 and 7.

Inoceramus undulatoplicatus (F. Roemer), Schluter. 1877. Kreide-Bivalven. Zur Gattung Inoceramus, p. 22, pl. 3, fig. 1.

" " Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, pl. 168, pl. 20, figs. 2 and 2*a*.

Inoceramus digitatus (Sowerby), Jimbo. 1894. Beitr. zur Kentniss der Fauna der Kreideform. von Hokkaido, in Dames and Kayser's Palæont. Abhandl. (Jena), Neue Folge, Band ii., heft 3, p. 43, pl. 8 (24), figs. 8-10.

The specimens of this species collected by Mr. Richardson on Vancouver Island in 1871 and 1872, and referred to in the second part of the first volume of the "Mesozoic Fossils," are nearly all of small size, though one individual, as there stated, is fully five inches and a-half in height. Some of them are higher than long, with a short hinge-line, and others longer than high, with a long hinge-line. Their sculpture also is equally variable, and consists either of continuous, concentric or radiating and divergent plications, or of corresponding rows of tubercles, in addition to the lines of growth.

In a paper on "Cretaceous Fossils from the Vancouver Island region,"[1] Dr. C. A. White doubts the correctness of the identification of the specimens collected by Mr. Richardson with *I. undulato-plicatus*, but they agree very well with Roemer's description, though perhaps not quite so well with his figure of that species.

However this may be, several small *Inocerami*, which are evidently conspecific with those collected by Mr. Richardson, were obtained by Dr. C. F. Newcombe in 1892 on the Comox River, V. I., and kindly presented by him to the Museum of the Geological Survey. With one exception, these specimens from Comox are all longer than high and have a long hinge-line. Their sculpture consists of concentric plications, which are rarely quite parallel with the closely and regularly disposed impressed lines of growth, upon the umbonal and central regions of each valve, and of radiating and divergent folds anteriorly.

The only specimen collected by Dr. Newcombe on the Comox River that is higher than long, with a short hinge-line, has very peculiar sculpture. In addition to the ordinary growth-lines, a nearly central and continuous longitudinal plication runs from the beak of the left valve (the only one preserved) to the base, a little in advance of the centre of the latter. On the anterior side, five simple plications radiate obliquely forward and outward from this subcentral fold, and on the posterior side

[1] Bull. U. S. Geol. Surv., No. 51, pt. 3, p. 37.

four plications, three of which are simple and one bifurcating, radiate also obliquely forward and outward from it.

In a letter received in August (1894) the writer was informed by Mr. T. W. Stanton (of the U. S. Geological Survey) that he had been recently studying a number of specimens of *Inocerami* with divergent radiating plications, from the Niobrara shales of Colorado, that he has no hesitation in referring to the *I. digitatus* of Sowerby, as re-defined and figured by Schmidt and Schluter, and that it seems to him quite likely that *I. undulato-plicatus*, Roemer, is only the young of that species. Schluter, in his paper on the Cretaceous *Inocerami*, is, indeed, inclined to keep these two forms separate, but Schmidt (*op. cit.*) regards both *I. undulato-plicatus*, Roemer, and *I. diversus*, Stoliczka, as mere synonyms of *I. digitatus*. Mr. Stanton adds, in effect, that although none of Schmidt's figures of *I. digitatus* exactly duplicate those of *I. undulato-plicatus* in the "Mesozoic Fossils," it still seems to him most likely that the Vancouver specimens are young individuals of *I. digitatus*, a conclusion in which the present writer entirely concurs.

Nucula Richardsonii. (Sp. nov.)

Nucula pectinata, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 161, pl. 18, fig. 8, but not *N. pectinata*, Sowerby, 1818.

Shell similar to *N. pectinata*, but less inequilateral and much shorter in proportion to its height, the beaks being more nearly central, the posterior side longer and more obliquely truncated, the anterior shorter and more broadly rounded at its outer termination.

The slightly distorted left valve from the lower part of the Trent River, Vancouver Island, which was referred with doubt to the *N. pectinata* of Sowerby by the present writer in 1879, appears to be sufficiently distinct from that species to warrant the new specific name now proposed for it, in memory of its discoverer.

Nucula Hornbyensis. (Nom. prov.)

Plate 3, fig. 2.

Perhaps a variety of *N. solitaria*, Gabb.

Cfr. *Nucula solitaria*, Gabb. 1869. Geol. Surv. Calif., Palæont., vol. ii., p. 197, pl. 32, fig. 94.

Shell of medium size for the genus, compressed convex, subelliptical in marginal outline, rather oblique and very inequilateral. Anterior or longer side obliquely subtruncated at its extremity above and rather narrowly rounded below; posterior or shorter side very regularly but narrowly rounded at the end; ventral margin broadly rounded, but rather more convex posteriorly than anteriorly; superior border nearly straight

but slightly descending in front of the beaks, and sloping obliquely and much more rapidly downward behind them; beaks small, incurved and recurved, projecting very little above the highest level of the superior border, placed behind the midlength, and in one specimen almost terminal.

Surface almost smooth, marked only by a few faint concentric striæ of growth; test thin.

Dimensions of the largest specimen known to the writer: length, eleven millimetres; height, eight millimetres. The specimen figured is not quite six millimetres in length.

Northwest side of Hornby Island, in the "Middle Shales or Division D" of Mr. Richardson's Comox Section, W. Harvey, 1894: one right valve, one left valve, and a somewhat crushed specimen with both valves, each with the test preserved.

These specimens may represent a variety of *Nucula solitaria*, but if Mr. Gabb's figure of that species is correct it must have a very different marginal outline. His illustration represents a much more triangular shell than that of *N. Hornbyensis*, with a more prominent beak, and more pointed at both ends.

Nucula Traskana, Meek, from the Cretaceous rocks of Vancouver Island, was described from a single worn cast of the interior of the shell, which has never been figured and has since been lost. Mr. Meek states that the specimen was "probably provided with a distinct lunule," and that "the species will probably be recognized by its ventricose trigonal ovate form and nearly central beaks." This description is quite inapplicable to the specimens from Hornby Island, in which the lunule and escutcheon are both obsolete.

Clisocolus dubius, Gabb.

Loripes dubius, Gabb. 1864. Geol. Surv. Calif., Palæont., vol. i., p. 177, pl. 24, figs. 170 and 171.

Clisocolus dubius, Gabb. 1869. Geol. Surv. Calif., Palæont., vol. ii., p. 189, pl. 30, fig. 7.

Lucina Richardsonii, Whiteaves. 1874. Geol. Surv. Canada, Rep. Progr. for 1873-1874, p. 266, pl. of foss., fig. 1.

Thetiopsis circularis, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i, pt. 2, p. 153.

Clisocolus dubius, White. 1889. Bull. U. S. Geol. Survey, no. 51, p. 41, pl. 6, figs. 5-7.

The specimens from Vancouver, Hornby and the Sucia islands, which the writer first described as *Lucina Richardsonii*, and afterwards referred to the *Thetis circularis* of Meek and Hayden, the type of Meek's suggested genus *Thetiopsis*, are obviously identical with the *Clisocolus dubius* as since figured by Dr. C. A. White, and with specimens from the Chico group of Shasta County, California, labelled *C. dubius*, and kindly loaned by Mr. Stanton. It still, however, appears to the writer that the

specimens collected by Mr. Richardson are much more like the *Thetis circularis*, as figured by Meek and by Whitfield, than they are to Gabb's illustrations of *C. dubius*.

Clisocolus cordatus, Whiteaves.

Clisocolus cordatus, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., p. 157, pl. 18, figs. 3, 3 *a-b*, but probably not *Cyprina cordata* of Meek and Hayden (1857) nor *Clisocolus dubius*, Gabb.

" " White. 1889. Bull. U. S. Geol. Surv., no. 51, p. 41, pl. 6, figs. 8 and 9.

The identification of the Sucia Islands specimens collected by Mr. Richardson with the species from the Fox Hills group of Dakota, which was first described by Meek and Hayden as *Cyprina cordata* and subsequently by Meek as *Sphæriola cordata*, has not proved satisfactory, and they seem to be quite distinct from Gabb's *Clisocolus dubius*.

Cytherea nitida, Gabb. (Sp.)

Cytherea Leonensis, Etheridge. 1861. Quart. Journ. Geol. Soc. Lond., vol. xvii., p. 432, but not *C. Leonensis*, Conrad, 1857.

Cytherea Conensis (err. typ. for *Leonensis*), Etheridge. 1863. The No. 42 of the list of specimens on page 243 of Capt. Palliser's official report.

Venus (Mercenaria?) varians, Gabb. 1864. Geol. Surv. Calif., Palæont., vol. i., p. 161, pl. 23, figs. 140 and 141.

Meretrix nitida, Gabb. 1864. *Ib.*, p. 165, pl. 23, figs. 145 and 146.

Chione varians, Gabb. 1869. Geol. Surv. Calif., Palæont., vol. ii., p. 239.

Caryatis nitida, Gabb. 1869. *Ib.*, p. 240.

Cytherea (Caryatis) plana, Whiteaves. 1879, Geol. Surv. Canada, Mes vol. i., pt. 2, pl. 17, figs. 14, 14 *a-b*; but probably not "*Venus planus*," Sby., nor *Aphrodina Tippana*, Conrad.

The writer has long been convinced that the specimens from Hornby, Vancouver and the Sucia islands, which he identified with the "*Venus planus*" of Sowerby, in 1879, are not that species, but the *Caryatis nitida* of Gabb. In December, 1892, Mr. Stanton examined these specimens while on a visit to Ottawa, and expressed the opinion that they could not be distinguished from *Chione varians*, Gabb. Since then Mr. Stanton has forwarded a series of each of these nominal species from the Chico group of California, and both he and the writer have quite independently come to the conclusion that the characters which Mr. Gabb relied upon to distinguish his *Caryatis nitida* from *Chione varians* are neither constant nor sufficient to justify their separation.

CYTHEREA ARATA, Gabb.

Meretrix arata, Gabb. 1864. Geol. Surv. Calif., Palæont., vol. i., p. 166, pl. 30, fig. 250.
" " Gabb. 1869. *Ib.*, vol. ii., p. 240.
Cytherea (Callista) laciniata, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 148, pl. 17, figs. 13 and 13*a*, and pl. 19, figs. 4 and 4*a*, but perhaps not *Cytherea (Callista) laciniata*, Stoliczka, 1871.

The specimens referred to *Cytherea* (*Callista*) *laciniata*, Stoliczka, in the "Mesozoic Fossils" (*op. cit.*, p. 148) have recently been found to be exactly similar to a specimen from the Chico group of Tehama County, California, which Mr. Stanton has identified with *Meretrix arata*, Gabb, and kindly loaned to the writer. The original description of the sculpture of *M. arata* is rather misleading. According to Mr. Gabb, its surface is "ornamented by regular, concentric, acute impressed lines," whereas, in the writer's judgment, it would be much more correct to say by small, concentric, rounded ribs, with very narrow furrows between them.

CYPRIMERIA LENS, Whiteaves.

Cyprimeria lens, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 152, pl. 17, figs. 15 and 15*a*, but not *Meretrix lens*, Gabb, 1864, which is probably not a *Cyprimeria*.
" " White. 1889. Bull. U. S. Geol. Surv., no. 51, p. 42.

Shell compressed convex, moderately inflated, ovately subcircular in marginal outline, and nearly as high as long; posterior side a little longer, and in some specimens rather more narrowly rounded than the anterior; basal margin broadly convex; superior border descending rapidly and obliquely in front of the beaks, gently convex and slightly prominent immediately behind them, thence curving gradually downward to the posterior end; beaks placed a little in advance of the mid-length, small, depressed, appressed and curved forward. No definite nor distinctly-margined lunule, and apparently no well-defined escutcheon.

Test rather thick, its surface polished and marked with numerous very fine and closely disposed concentric striæ, also with four or five distant and coarser linear concentric grooves or periodic arrests of growth.

Hinge with two cardinal teeth and one lateral tooth in the left valve. The two cardinal teeth are transverse and divergent, the anterior one being thick and excavated in the middle, but not bifid. The lateral tooth, which is thin and feebly developed, is partially separated from the cardinal fulcrum by a narrow, shallow groove. Anterior muscular impression large and subovate; posterior muscular scar, pallial line and hinge dentition of the right valve unknown.

Northwest side of Hornby Island, J. Richardson, 1872: one left valve. Sucia Islands, J. Richardson, 1874; three imperfect right valves

and one left valve, the latter showing the hinge dentition of that valve; and Dr. C. F. Newcombe, 1894: one large and perfect left valve.

These are most probably not identical with the *Meretrix lens* of Gabb, as the writer once supposed they were. The specimen from Hornby Island is a little more pointed posteriorly than those from the Sucia Islands, but this feature is rather exaggerated in the unsatisfactory figure of this specimen, on Plate 17 of the "Mesozoic Fossils." The specimens from the Sucia Islands have more the general contour of a *Dosinia* than of a *Meretrix* (or *Cytherea*, as that genus is more frequently called), and their hinge dentition is that of *Cyprimeria*. In the original description of *Meretrix lens* nothing is said, and nothing appears to be known, about the hinge dentition or other characters of the interior of the shell, but there are at present no valid reasons known to the writer for doubting the correctness of its reference to the genus *Cytherea* or *Meretrix*.

Mr. Stanton, who has kindly compared the Sucia Islands specimens with Meek's types of *Cyprimeria (?) tenuis*, from Vancouver and Newcastle islands, thinks that the latter species (whose internal characters are still unknown) is much more compressed and has a different outline.

Tellina occidentalis, Whiteaves.

Tellina (Peronæa) occidentalis, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 144, pl. 17, figs. 11 and 11 *a*; but not *Tellina occidentalis*, Morton, 1842, which is a *Lucina*; nor *Thracia (?) occidentalis*, Meek, 1857.

The specimens from Gabriola Island and the Nanaimo River, which the writer formerly supposed to be referable to *Thracia occidentalis*, Meek, prove to be distinct from that shell, which Mr. Stanton states has a "pearly lustre and other characters of the *Anatinidæ*."

GASTEROPODA.

Eunema cretaceum. (Sp. nov.)

Plate 3, fig. 3.

Shell small, imperforate, apparently elongate turbinate, with the spire about equal in height to the outer volution, as viewed dorsally, though the few specimens collected so far are so crushed that their exact original shape is uncertain. Volutions five or six, those of the spire step-shaped or shouldered, but flattened somewhat obliquely next to the shoulder above, the outer volution rounded and moderately ventricose below the shoulder; suture distinct and angular.

Surface marked with narrow but comparatively distant spiral ridges, which are crossed by very numerous, close set and regularly arranged,

acute, longitudinal, thread-like raised lines. On the dorsal portion of the last volution of the spire there are three of these spiral ridges, and upon that of the outer volution about seven. Test thin, its inner layer distinctly nacreous.

The exact dimensions cannot be given, but an average specimen is estimated to have been eleven millimetres and a-half in length and nine in maximum breadth, when perfect.

Northwest side of Hornby Island, W. Harvey, 1894: four or five crushed specimens.

This interesting little shell is referred to the genus *Eunema* mainly on the authority of Zittel,[1] who states that *Amberleya*, Morris and Lycett, and *Eucyclus*, Deslongchamps, are synonymous with it, and that it ranges in time from the "Lower Silurian" into the Cretaceous.

NERINÆA DISPAR? Gabb. (Var.)

Plate 3, fig. 4.

Cfr. *Nerinæa dispar*, Gabb. 1864. Geol. Surv. Calif., Palæont., vol. i., p. 113, pl. 19, figs. 66 and 66 *a*.

Shell essentially similar in shape and surface markings to *N. dispar*, but smaller, and devoid of the rounded spiral fold at the base of each volution said to be characteristic of that species, also with the longitudinal ribs apparently obsolete on the lower volutions.

Hornby Island, W. Harvey, 1894: three specimens. The most perfect of these has seven volutions preserved, with the minute details of the sculpture of each quite clearly shown. The three upper volutions are marked with small longitudinal ribs which cross the volutions transversely, but on the three lower volutions these ribs appear to be absent, though their absence may be due to the exfoliation of part of the outer layer of the shell.

TESSAROLAX DISTORTA, Gabb.

Tessarolax distorta, Gabb. 1864. Geol. Surv. Calif., Palæont., vol. i., p. 126, pl. 20, figs. 82 and 82, *a-b*.
" " Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 123.

Northwest side of Hornby Island, in the "Middle Shales or Division D" of Mr. Richardson's Comox section, W. Harvey, 1894: nine specimens, most of them preserved in a very brittle shale.

CYPRÆA SUCIENSIS. (Nom. prov.)

Plate 3, fig. 5.

Shell small, moderately inflated, narrowly subovate and a little more than half as broad as long, emarginate at both ends, but much more

[1] Handbuch der Palæontologie, vol. ii., 1884, p. 189.

deeply so posteriorly than anteriorly. Spire entirely covered when the outer coating of enamel is perfect, but in the only specimen collected the enamel is partially exfoliated in such a way as to show that underneath it the spire is very small, conical, and composed of at least four volutions, also that it extends just as far backward as the produced posterior end of the outer lip. This partial exfoliation of the outer layer of enamel is, however, barely perceptible to the naked eye, and is not shown in the figure. Outer volution very large in proportion to the rest, broadest and most inflated a little behind the mid-length, abruptly attenuate behind, but narrowing much more gradually in front, its anterior margin being narrowly rounded; outer lip thickened exteriorly and considerably produced behind; inner or columellar lip also produced behind and separated from the outer lip by a narrow channel or canal; characters of the interior of the aperture unknown, though it clearly extended the whole length, and is narrow and linear behind.

Surface smooth.

Dimensions of the specimen described (which has been kindly presented by its discoverer to the Museum of the Geological Survey); length, twenty millimetres; greatest breadth, twelve millimetres.

Sucia Islands, Dr. C. F. Newcombe, 1894.

Most of the aperture of this interesting little fossil is filled with the tough and tenacious matrix, so that it is impossible to ascertain whether there are or are not any crenulations on the inner surface of the outer lip, or any denticulations or plications on the columellar side. The external characters of the specimen, however, would seem to show that it is a small smooth *Cypræa*, very closely allied to the *C. Cunliffei* of Forbes,[1] from the Arrialoor group of the Trinchinopoly district of Southern India, and it may prove to be only a variety of that species. The *Cypræa Bayerquei* and *C. Mathewsoni*, described in the first and second volumes of the Palæontology of California as from the Tejon group of that state, are now generally regarded as Eocene fossils.

CEPHALOPODA.

Phylloceras Velledæ, (Michelin) D'Orbigny.

Ammonites Velledæ (Michelin), D'Orbigny. 1840. Pal. Franc., Terr. Cret., vol. i. p. 280, atlas, pl. 82; also of Pictet and Campiche, and Stoliczka.

Ammonites (Scaphites?) ramosus, Meek. (1857.) Trans. Albany Institute, vol. iv., p. 45.

Phylloceras ramosus, Meek. 1876. Bull. Geol. and Geogr. Surv. Terr., vol. ii., no. 4, p. 371, pl. 5, figs. 1, 1, *a-b*.

Ammonites Velledæ, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 103.

Northwest side of Hornby Island, W. Harvey, 1892: two fine speci-

[1] Trans. Geol. Soc. Lond., vol. vii. (1846), p. 134, pl. 12, fig. 22; and Stoliczka (1868), Cret. Foss. S. India, vol. ii., p. 55, pl. 4. fig. 4.

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L. M. LAMBE, F.G.S., DEL

To Illustrate Mr. Whiteaves's Paper.

O. E. PRUD'HOMME, LITH.

mens. The smaller of these, which is now in the Museum of the Geological Survey, is seventy-four millimetres, or nearly three inches, in its greatest diameter.

Phylloceras Indra. (Var.)

Ammonites Indra, Forbes. 1846. Trans. Geol. Soc. Lond., vol. vii., p. 105, pl. 11, fig. 7.
" " Stoliczka. 1865. Cret. Cephalop. S. India, vol. i., p. 112, pl. 58, fig. 12.
" " Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 105, pl. 13, figs. 2 and 2 *a*.

Northwest side of Hornby Island, W. Harvey, 1892: a single specimen, about four inches and a-half in its maximum diameter, which is apparently referable to this species. Its volutions, however, are more nearly circular than those of the type of *Ammonites Indra*, as described and figured by Stoliczka, and than those of the specimen from Hornby Island collected by Mr. Richardson in 1871. Its surface, also, is marked by numerous but very faint and almost obsolete spiral ribs, in addition to the usual and equally faint curved transverse furrows and fine lines of growth.

Lytoceras Jukesii, Sharpe.

Plate 2, figs. 1 and 2.

Ammonites Jukesii, Sharpe. 1853. Descr. Foss. Rem. Mollusc. found in Chalk of England, p. 53, pl. 23, figs 11, *a-e*.
" " Pictet and Campiche. 1858-60. Pal. Suisse, Foss. St. Croix, pt. i., p. 350.
" " Whiteaves. 1876. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 111, pl. 13, figs. 3, 3, *a-b*.

Middle of east side of Denman Island, W. Harvey, 1892: four fine specimens, one a little less and three a little more than four inches in their maximum diameter.

The specimen from Norris Rock, south of Hornby Island, which was referred to this species, though with some doubt, in the second part of the first volume of "Mesozoic Fossils," is a fragment of the inner whorls, a little more than two inches in diameter, which has been described in detail and figured. Three of the specimens from Denman Island have at least seven of the volutions preserved, and all four are referred with some confidence to *A. Jukesii*, which proves to be a *Lytoceras*, as suspected in 1879. In one of these specimens (figure 2) the sculpture of the test is beautifully preserved on the outer volution. It consists of very narrow, sharp and prominent simple transverse ribs, which curve convexly forward next to the umbilical margin, but are nearly straight on the sides and periphery. At the commencement of the volution these ribs are two

millimetres apart on and near the periphery, but the flat, smooth intervals between them gradually become wider and wider, until at last the ribs in the same region, near the aperture, are as much as seven millimetres apart.

A characteristic fragment of this species was collected by Mr. Harvey in 1892, on the northwest side of Hornby Island.

Anisoceras Vancouverense, Gabb. (Sp.)

Hamites Vancouverensis, Gabb. 1864. Geol. Surv. Calif., Palæont., vol. i., p. 70, pl. 13, fig. 18.

Northwest side of Hornby Island, W. Harvey, 1893 : one good specimen, upwards of five inches in length and four in its greatest breadth, which is now in the possession of the Provincial Museum at Victoria, B.C. The maximum diameter of the shelly tube of which it is composed is forty-five millimetres. The "prolonged portion," as Stoliczka calls it, is much longer than the "reflected portion," and the former is slightly incurved posteriorly.

A much more perfect specimen, which measures nearly eight inches in its maximum length, and which has been described and figured in the "Canadian Record of Science" for April, 1895, has been collected quite recently by Mr. Harvey at Hornby Island. This specimen shows that the earlier portion of the shell in this species is narrowly elongated, sinuous, spirally twisted and curved obliquely outward, as in *Anisoceras*, before becoming straight and prolonged, and that it does not consist of a slender shelly tube bent twice or more upon itself, as in *Hamites*.

Hamites obstrictus, Jimbo.

Hamites cylindraceus, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 113, pl. 14, figs. 2 and 2 *a*, but not *H. cylindraceus* of Defrance or D'Orbigny.

Hamites obstrictus, Jimbo. 1894. Beitr. zur Kennt. der Fauna der Kreideform. von Hokkaido, in Dames and Kayser's Palæontol. Abhandl., n. ser., vol. vi., p. 38, pl. 7 (23). figs. 2, 2, *a-b*.

Posterior extremity of the shell unknown, the prolonged and reflected portions slender, straight, almost circular in outline in transverse section, unless when abnormally compressed, and separated from each other by a space about equal in width to the maximum diameter of the reflected portion, near the aperture.

Surface marked by prominent, narrow, simple and rarely bifurcating transverse ribs, which are rounded at their summits and separated by rather deep concave furrows. Besides the ribs, or rather furrows, there is a single transverse constriction on the reflected portion of the shell. On the prolonged portion the ribs are about one millimetre apart, but on the reflected portion they are nearly two millimetres apart.

Sutural line as represented on plate 14, figure 2*a*, of the second part of the first volume of "Mesozoic Fossils," published by the Geological Survey of Canada.

Sucia Islands, J. Richardson, 1874: one crushed specimen, with the sutural line well preserved. Northwest side of Hornby Island, W. Harvey, 1893: two good specimens, one of them apparently free from distortion. All three, upon the whole, agree remarkably well with Jimbo's description and figures of *H. obstrictus*, although in that species there are two transverse constrictions of the prolonged portion of the shell, as well as one on the reflected portion, and the lobes and saddles of its sutural line are perhaps not quite so numerously incised as those of the specimen from the Sucia Islands.

Desmoceras Gardeni, Baily.

Ammonites Gardeni, Baily. 1855. Quart. Journ. Geol. Soc. Lond., vol. ii., p. 456, pl. 11, fig. 3.
" " Stoliczka. 1865. Cret. Ceph. S. India, vol. i., p. 61, pl. 33, fig. 4,
" " Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 102.
Desmoceras Gardeni, (Baily), Zittel. 1884. Handbuch der Palæont., vol. ii., p. 466.
Puzozia Gardeni, Kossmat. 1894. Jahrbuch der k. k. geolog. Reichsanstalt, vol. xliv., p, 472.

Comox River, V. I., Dr. C. F. Newcombe, 1892: two specimens.

Pachydiscus Ootacodensis, Stoliczka. (Sp.)

Ammonites Ootacodensis, Stoliczka. 1865. Cret. Cephal. S. India, p. 109, pl. 54, figs. 3 and 4, and plates 56 and 57.
Pachydiscus Ootacodensis, Kossmat. 1894. Jahrbuch der k. k. geolog. Reichsanstalt, vol. xliv., p. 472.

In the paper last quoted a fine specimen of this species is stated to have been recognized by Dr. Kossmat in a part of Sir James Hector's collection from Nanaimo, now in the British Museum (Natural History) at South Kensington. It is difficult, however, to see how the Ammonite from Vancouver Island, which Mr. Gabb figures on Plate 27 of the first volume of the Palæontology of California as *A. Newberryanus*, can be distinguished from *Pachydiscus Ootacodensis* on the one hand, or from *P. Suciensis* (the *Ammonites complexus*, var. *Suciensis*, of Meek) on the other. This *Ammonite* has long been known to be quite distinct from *Ammonites Newberryanus*, Meek. An essentially similar specimen, which may therefore be referable to *P. Ootacodensis*, was collected by Mr. Richardson in 1873 at Northwest Bay, Vancouver Island. It is the specimen referred to as No. 2 on page 109 of the second part of the first volume of "Mesozoic Fossils," published by the Geological Survey of Canada, under the heading *Ammonites complexus*, var. *Suciensis*.

Pachydiscus Haradai, Jimbo.

Plate 3, fig. 6.

Pachydiscus Haradai, Jimbo. 1894. Beitr. zur kenntniss der Fauna der Kreideform. von Hokkaido, in Dames and Kayser's Palæont. Abhandl., n. s., vol. vi., p. 29, pl. 2 (18), figs. 2, 2, *a-b*.

Cfr. also *Ammonites Egertonianus* (Forbes), Stoliczka. 1865. Cret. Cephal. S. India, p. 104, pl. 53, figs. 1-4.

Nanaimo River, ten miles from its mouth, A. Raper, May, 1893: a fine specimen about six inches in its maximum diameter, which agrees remarkably well with Jimbo's description and figures of *P. Haradai*. It differs, however, very little from the type of *Ammonites Egertonianus*, Forbes, as figured by Stoliczka, or from *Pachydiscus Suciensis*. Its volutions are compressed at the sides, the periphery is regularly rounded, and the umbilicus occupies rather less than one-third of the entire diameter. There are eleven large, continuous and distant simple ribs on the outer volution, with from one to four rather smaller and shorter ribs between them, and the intervals between all of them are finely and transversely striated.

Belemnites. (Species undeterminable.)

Beach at Hornby Island, W. Harvey, 1892: a slender phragmocone, forty millimetres long and seven millimetres broad at the larger end. The chambers are very numerous and the siphuncle is marginal.

CRUSTACEA.

Decapoda.

Podocrates Vancouverensis. (Sp. nov.)

Carapace flattened, rectangular, longer than broad, marked by three low angular tuberculose, or spinose longitudinal ridges, one in the median line, and one near each of the lateral margins, and divided at about one-third the distance from the front by an obtusely subangular cervical groove, which is rather broad but not very deep. On the anterior portion, or cephalic arch, the lateral longitudinal ridges are well developed, and armed with larger and more spinose tubercles than those on the corresponding ridges of the posterior portion, one a little behind the mid-length on each ridge being larger than any of the others, but the central ridge is obsolete. In its place, just in advance of the cervical groove, there is an ovate lanceolate or narrowly spear-shaped area, which is elevated at the pointed end anteriorly, shallowly depressed posteriorly, and margined with a single row of small tubercles. Immediately in front of this area there is a pointed or spinose tubercle, almost in a line with

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the largest tubercle on each of the lateral ridges, and still farther forward there are two similar tubercles at a short distance from the anterior margin and about seven millimetres apart. On the posterior portion, or scapular arch, the three longitudinal ridges are minutely tuberculated, and extend from the posterior margin to the cervical groove, where they each terminate in a pointed tubercle larger than any of the rest, but the central ridge is shorter than either of the two lateral ridges. Antero-lateral angles of the carapace each armed with a nearly straight but slightly divergent spine. Rostrum, central portion of the anterior margin and position of the eyes unknown. External antennæ broad and flattened at their bases, inner antennæ cylindrical at theirs.

Walking feet slender, as is usual in the genus.

In addition to the spines and tubercles on the lateral ridges and elsewhere, as already described, the whole of the upper surface of the carapace is minutely granulose and apparently setose, the perforations at the summits of each of the granules and numbers of minute objects, which seem to be detached setæ, being plainly visible under an ordinary lens.

Two miles up the Puntledge River, Vancouver Island, Rev. G. W. Taylor, 1889: a good specimen of the carapace, with the rostrum and a small piece of the anterior portion broken off, but with considerable portions of the ambulatory feet and the bases of the inner and outer antennæ preserved. This interesting fossil is now in the Museum of the Geological Survey of Canada.

Hornby Island, W. Harvey, 1893: a less perfectly preserved specimen, showing most of the carapace (but not the rostrum), portions of the ambulatory feet, and the dorsal aspect of four segments of the abdomen, though it is uncertain whether their margins were denticulated or not.

In the second volume of Transactions of this Society the writer described a long-tailed decapod crustacean from the Cretaceous rocks at the Highwood River in Alberta, under the provisional name *Hoploparia* (?) *Canadensis*. Dr. C. Schluter, of Bonn, Germany, in a letter dated February 20, 1890, expresses the opinion, which appears to be well founded, that this species, which is figured on plate 11 of the first part of the first volume of "Contributions to Canadian Palæontology," is a *Podocrates*, closely allied to, if not identical with, the *P. Dülmensis* of Becks. *Podocrates Canadensis*, as it should now be called, may prove to be only a local variety of *P. Dülmensis*, but *P. Vancouverensis* seems to differ from that species in the much smaller proportionate size of the tubercles on the three longitudinal ridges on its carapace, especially posteriorly, and in the different arrangement of the distant spinose tubercles on the anterior moiety of its cephalic arch.

V.—*Note on the occurrence of Primnoa reseda on the coast of British Columbia.*

By J. F. WHITEAVES.

(Read May 16, 1895.)

P. reseda is a large, branching or tree-like Alcyonarian coral, that, as shown by Professor Verrill,[1] was first described by the Russian naturalist Pallas, in his "Elenchus Zoophytarum," published in 1766, as *Gorgonia reseda*, and subsequently by Linnæus, in the twelfth edition of the "Systema Naturæ," published in 1767, as *Gorgonia lepadifera*.

The genus *Primnoa* was constituted for its reception by Lamoroux in 1816, and it was made the type of a distinct family, the Primnoadæ, by Dr. J. E. Gray in 1859. In the report on the Alcyonaria collected by H.M.S. "Challenger," by Professors Wright and Studer, published in 1889, *P. reseda* is included in the family *Primnoadæ*, of section 2 of the order *Gorgonacea* of Verrill. This order is there defined as consisting of "fixed colonial Alcyonaria with a more or less firm internal axis, which is covered by a cœnenchyma from which the polyps, with their short body cavities, arise." Section 2 of that order, for which the term *Holaxonia* is proposed, is described as including seven families of "Gorgonacea with an axis which consists of horny material, or of a calcified horny substance, or of alternating joints of amorphous calcareous material and horn." The family *Primnoadæ* is re-defined as follows: "Holaxonia with a calcareous and horny axis, basal attachment always calcareous. The polyps with a projecting, usually club-shaped calycine portion, tentacular portion retractile. The cœnenchyma contains a superficial layer of scale-like calcareous bodies, which are continued upwards over the calyx, where they are arranged in regular sequence, usually bilaterally symmetrical, they overlap each other around the margin of the calyx; eight of the scales form an operculum, and they may be brought together so as to close the opening. The calyces are movable; they are thrust outward when erect, or are, when retracted, turned towards the stem, so as to lay their oral apertures against the stem. In some species this retraction is also accompanied by a twisting of the base of the calyx, which turns the oral aperture downwards." The amended definition of the genus *Primnoa*, in this report, is as follows: "The colony is branched. The polyps occur in close spirals over the entire periphery of the stem and branches. Each polyp calyx is inclosed dorsally and laterally by two large scales, of which there are two longitudinally overlapping rows, the upper margin of one scale always overlapping the lower border of the next. There is

[1] In Bull. Mus. Comp. Zool., Cambridge, Mass., vol. 1 (1864), p. 37, and in subsequent papers.

a ventral space destitute of scales, except at the calyx margin, where four are present, forming with the two pairs of dorso-lateral scales an operculum. The calyces can be turned downwards from the stem."

Professors Wright and Studer state that the type species of this genus, *Primnoa reseda*, L., "seems limited to the Atlantic Ocean, where it is found from the Cape de Verdes to the Polar Sea ; it has been dredged in deep water off Setubal, at St. George's Banks, and in the Bay of Fundy."

In the spring of 1894, however, Mr. Otto J. Klotz, D.T.S., of this city, obtained a fine specimen of an Alcyonarian, which Professor Verrill has identified with this species, on the coast of British Columbia. This specimen, which Mr. Klotz has kindly presented to the Museum of the Geological Survey, is stated by him to have been hooked by an Indian in the fall of 1893, while halibut fishing in Work Canal, near Port Simpson, in about twelve fathoms of water. Its colour, when fresh out of the water, is said to have been bright red, but when it came into Mr. Klotz's hands it was creamy pink. It is upwards of three feet in height and a little more than two feet in the maximum spread of its branches.

A characteristic fragment of another specimen of *P. reseda*, which is stated to have been collected on the north coast of the Queen Charlotte Islands, has recently been presented to the Museum of the Survey by W. B. Anderson, of Comox, V.I., through Professor Macoun. It would appear, therefore, that this long known and interesting species is not uncommon in the northern part of the Pacific Ocean. Three large Alcyonarians are now known to occur on the coast of British Columbia, viz., *Verrillia Blakei*, Stearns, *Paragorgia Pacifica*, Verrill, and *Primnoa reseda*, Pallas, sp. Fine examples of each of these are in the Museum of the Geological Survey of Canada.

VI.—*On Collections of Tertiary Plants from the Vicinity of the City of Vancouver, B.C.*

By Sir WILLIAM DAWSON, F.R.S., etc.

(Read May 15, 1895.)

In the southern part of the province of British Columbia, in the district extending from Burrard's Inlet to the United States boundary, and which has long been coloured on the maps of the Geological Survey as of Tertiary age, while the sections accompanying these maps show its rocks as overlying the Cretaceous coal-measures of the Nanaimo group, fossil plants and beds of lignite have for some time been known to exist, but the former have not been specially studied. The beds have, however, been regarded as probably continuous with the lignite-bearing formation of the eastern part of Washington Territory, recently designated by the geologists of the United States Survey as the Puget group.

In the Report of the Geological Survey of Canada for 1876-7,[1] notices of this formation appear by Dr. G. M. Dawson and by the late Mr. Richardson. Mr. Bowman was subsequently engaged in exploring it for coal,[2] and small collections of the fossil plants have been made by several of the officers of the Survey, and more recently a larger collection has been made by Mr. G. F. Monckton, of Vancouver.

The geological relations of the beds, as ascertained in Canada, are referred to by Dr. G. M. Dawson, in a paper published in the "American Journal of Science" for 1890, as follows:

"While referring to the Puget group, it may be added that a considerable tract of low land about the mouth of the Fraser River, and extending northward to Burrard Inlet, is underlain by rocks which, though as yet only partially examined, appear, with little doubt, to correspond to that group, with which they are geographically connected, and, so far as known, lithologically identical. Mr. A. Bowman has ascertained that these strata are at least 3,000 feet in thickness, and, like those of the typical area of the Puget group, they hold carbonaceous matter and more or less lignite coal at many different horizons."[3]

In the same paper he remarks on the possibility that some of the unfossiliferous beds overlying the Cretaceous coal-measures of the Nanaimo group at Comox and elsewhere in Vancouver Island, may represent this same Puget group, or in part the underlying Tejon group of California.

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[1] Pages 125 *et seq.* and 188 *et seq.*

[2] Report Geol. Survey of Canada, 1888, pt. i., p. 66*a*.

[3] Am. Jour. Science, vol. xxxix., March, 1890.

In the same year (1890) a small collection of plants made by Prof. Lawson, then of the Geological Survey, was submitted to the writer, and though the specimens, too few and imperfect to form the subject of a separate paper, they were recognized as probably of Upper Laramie or Eocene age.

The supposed equivalents of these beds in the United States territory have been cursorily examined by several geologists of that country. They are known to rest on Cretaceous rocks identified by their fossils with the Nanaimo group of British Columbia, which is known to be Upper Cretaceous. Their vegetable and animal fossils are held to indicate deposition in an estuary, and their plants are regarded as Tertiary, though they have been referred to different ages, extending from the Laramie to the Miocene. The latest views of Lesquereux, Newberry White, Knowlton and other palæobotanists and geologists of the United States, seem to be that the beds are of Eocene age, and that the fossil plants may be best compared with those of the Upper Laramie or Fort Union group of the interior plains.

These points were discussed by Prof. C. A. White in the Bulletin of the United States Geological Survey, No. 51, 1889, in which he also refers to the work of Barclay Willis and the late Dr. Newberry. A later account of them is given by Prof. W. B. Clark, in the Bulletin of the same Survey No. 83, 1891. They are also referred to by Dr. Dall in his correlation papers on the Neocene, and by Fairbanks in a paper on "The Geology of the California Coast Ranges."[1]

From these papers it would appear that the beds of the Puget group may amount to 10,000 feet in thickness, and consist of yellow and gray fine-grained sandstones and gray arenaceous shales, carbonaceous shales and beds of coal or lignite. Of the latter, seventeen are said to be workable, ranging from three to fifteen feet in thickness. The group is locally overlain by beds of coarse and fine gravel, probably Pleistocene, which have in some places a thickness of 300 feet, and which attain to an elevation of 2,000 feet above the sea in the Cascade range. These superficial beds are filled with pebbles of hard volcanic rock, similar to that of beds or masses overlying the Puget group and to veins traversing it. These volcanic rocks may be of Pliocene age. They form the highest peaks of the Cascade Mountains, 14,000 feet in height, and must of course be newer than the beds of the Puget series.

Under the Puget group there appear in a few places marine Cretaceous beds, holding *Baculites*. These beds have been disturbed before the deposition of the former group. They are probably of the age of the Nanaimo series.

The animal fossils of the Puget group are fresh-water and brackish-

[1] Bulletin Geol. Society of America, 1891.

water forms, indicating the prevalence of estuarine conditions. They naturally give fewer indications as to age than those afforded by marine species, but they are of Tertiary rather than Cretaceous aspect. They are described by White in the paper above referred to. The plant remains will be noticed in comparison with those of British Columbia in the sequel.

This great estuarine deposit extends from Burrard's Inlet, in British Columbia, nearly to the Columbia River, and from the coast-line to the Cascade range, within which its beds rise to a height estimated at from 800 to 5,000 feet above the level of the sea.

It is evident from the above statements that the Puget group of the west occupies a stratigraphical position, and presents conditions not very dissimilar from those of the Upper Laramie east of the mountains. The species of mollusks found in it, and to some extent those of plants also, are different from those of the Laramie. But this is to be expected in estuarine deposits, which, though identical in age, belong to bodies of water emptying respectively into the Pacific and the Atlantic, and separated by a considerable breadth of continuous and probably elevated land.

Assuming, then, that we have to deal with a formation overlying the Chico and perhaps the Tejon series of the United States geologists, in California and Oregon, and the Nanaimo formation of Vancouver Island, and indicating a transition from marine to estuarine conditions, the question comes up of the identity of the Nanaimo group in age with the more southern Cretaceous formations above named. On this point White, after comparing the fossils described by Whiteaves from the Nanaimo beds with those farther south, fully admits their correspondence with those of the Chico, but not with those of the Tejon, which have a decidedly newer aspect, and may be regarded as Eocene. There is, however, in California a transition between the Chico and Tejon, but both appear to underlie the Puget, unless, indeed, the latter is in part an estuarine equivalent of the marine beds of the former. In like manner, in British Columbia the estuarine conditions of the Burrard's Bay beds seem immediately to succeed the Nanaimo formation. This would be natural if the Puget beds represent the estuary of a northern river.

This absence of marine fossils from the beds succeeding the characteristic Upper Cretaceous, raises the same doubts as to age which have affected the Laramie beds east of the mountains. Hence, in both cases, the fossil plants become of much importance, while the fact that they have been variously referred to Cretaceous, Eocene and Miocene ages has tended to throw discredit on their evidence. In so far as Canada is concerned, it has now been established that the Upper Laramie or Fort Union beds underlie a formation containing animal fossils of the White River

Miocene[1] period, so that there can be no doubt as to their Eocene age. In like manner, in British Columbia, as will appear in the sequel, there are lacustrine beds with a flora of Oligocene or Miocene age, and which is quite distinct from that of the formation which forms the subject of this paper.[2]

At the same time it must be admitted that in the laying down of deposits of so great thickness, and covering necessarily a very long time, there may have been important changes in the flora, and that in an estuarine series in the vicinity of the Pacific coast on the one hand, and of extensive mountain ranges on the other, there may have been great local diversities, and the intermingling of plants of coastal flats with those of elevated mountain valleys. On the other hand, there may have been an equability of climate permitting the co-existence of types now widely separated. Independently of the fact that we are here near the dividing line between Cretaceous and Tertiary times, and may therefore expect a transition flora, these are circumstances which may well give rise to difficult questions, awaiting their ultimate settlement till the succession of the beds has been more definitely ascertained and larger collections have been made from different localities and horizons.

In the meantime I shall hope to show that we have in the Burrard Bay collections at least the pre-intimations of an early Tertiary flora, occupying the space between the Cretaceous flora of the Nanaimo series and the Oligocene or Miocene flora of the Similkameen district.

The specimens referred to in this paper are all from a limited locality in the vicinity of Burrard's Inlet, and therefore from near the northern margin of the estuarine formation referred to.

The earliest is a small collection made by Prof. Lawson, of the Geological Survey of Canada, a notice of which was contributed by the author to the Report of the Survey for 1890, with the remark that in so far as any conclusion could be based on so small a collection, the plants might be regarded as of Upper Laramie or Eocene age.

Some additional specimens were afterwards collected by Dr. G. M. Dawson, by Mr. James Macoun and others, in the neighbourhood of Vancouver, at Hastings Station and Stanley Park, and a few determinable leaves were obtained from the core of a bore-hole sunk at Hastings.

The somewhat larger collections made subsequently by Mr. G. F. Monckton, of Vancouver, from the shores of Burrard's Inlet, he has kindly placed in my hands for study.[3]

These collections no doubt represent very imperfectly the flora of the formation, and, owing to the fragile character of the matrix, few of

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[1] Trans. Royal Society of Canada, 1886—Fossil Plants of Laramie.

[2] Trans. Royal Society of Canada, 1890—Fossil Plants of Similkameen, etc.

[3] Additional collections made by Mr. C. Hill-Tout while this paper was in preparation, will also be mentioned below.

the leaves are perfect. They suffice, however, to testify to the age of the deposit, and to enable some comparisons to be made with the plants which have been obtained from the extension of these beds to the southward. They probably represent only a limited thickness of beds near the base of the formation.

I have to acknowledge my obligation to Prof. F. H. Knowlton, of the United States Geological Survey, for information as to work now in progress on the equivalents of the Burrard Inlet beds in the United States.

NOTES ON THE SPECIMENS.

LASTREA (GONIOPTERIS) FISCHERI, Heer.

(Fig. 1.)

Heer, Flora Ter. Helv., i., p. 34; Lesquereux, Report U.S. Geol. Survey, vol. viii., p. 239.

This fern occurs on one of the discs of the core from the Hastings boring, and also on specimens of shale from the town of Vancouver. Lesquereux's locality is John Day, Oregon, in beds supposed to be Eocene.

NEUROPTERIS CIVICA, s. n.

(Fig. 2.)

On light-coloured fine sandstone from the city of Vancouver. The frond or pinna is pinnate, with a thick rhachis. The pinnules are cordate and broad below, somewhat curved and tapering upward to an obtuse point. The midrib is slender and evanescent; the veins straight and once-bifurcate near their bases, the margin even. This form may perhaps be referred to genus *Cladophlebis*. I do not find any described Tertiary species precisely similar. It is provisionally referred to *Neuropteris*, but should fruit be found will no doubt be placed in some more modern genus.

LYGODIUM NEUROPTEROIDES, Lesquereux.

(Fig. 3.)

Lesquereux, U. S. Geological Survey, vii., p. 61.

"Fronds cordate, two to five, palmately lobed; divisions oblong or obovate, lanceolate, obtuse; middle nerve thin; lateral veins close, numerous, dichotomous."

Burrard's Inlet (Monckton collection), also core of Hastings borings and Stanley Park. All the specimens are imperfect, but correspond with portions of Lesquereux's figures. Lesquereux's specimens are from the

Washakie series, Burrell's Springs, Oregon, found along with palm-leaves (*Sabalites* and *Flabellaria*). Lesquereux refers the species to the Lower Eocene. In Newberry's unpublished plates very similar leaves are referred to *L. Kaulfussi*, Heer, a European Tertiary species. Our imperfect specimens may be referred to either species, if these are really distinct.

Asplenites, sp.

(Fig. 4.)

A little fertile pinna from Stanley Park indicates a fern of this genus, which may be merely noted in the meantime, until more perfect specimens occur.

Glyptostrobus Europæus, Heer.

A few branchlets referable to this species appear on surfaces of the core from Hastings. They appear to belong to the variety known as *G Ungeri*, which is found in the Bad Lands of Dakota and in Alaska, in beds probably Eocene. The specimens figured by Lesquereux from Oligocene beds at Florissant are different, and most likely, as Lesquereux himself suggests, belong to a distinct species. (Lesquereux, U. S. Reports, vol. viii., p. 222.)

Sabal Campbellii, Newberry.

(Fig. 7.)

Newberry's Illustrations of Cretaceous and Tertiary Floras, pl. x.; Notes on Extinct Floras, p. 49; Lesquereux, U. S. Geol. Survey, vol. viii., p. 113.

Newberry's figure, said to represent a species found at Bellingham Bay and elsewhere, corresponds with a number of fragments in Mr. Monckton's collections from Burrard Inlet. In the unpublished plates for Prof. Knowlton's revision of Newberry's plants, the same figure is named *S. grandifolia*, and is stated to be from Yellowstone Valley, Fischer's Peak, Colorado, while another form is figured as *S. Campbellii*, and credited to Bellingham Bay. I hope that more perfect specimens from Burrard's Inlet, and reference to Newberry's original specimens before publication, may clear up this apparent difficulty.

Our specimens, so far as can be made out, correspond with Newberry's original figure, except that in it the parallel veins are not seen. In our specimens there are about twelve veins on each slope of the folds, at about six inches from the base of the leaf.

The species is quite distinct from *S. Victoriæ* of the Cretaceous coal-measures of Nanaimo, which resembles more nearly *S. Grayana* of Lesquereux. Species of *Sabal* are widely distributed through the early Tertiaries of western America, but they are known principally by mere

fragments of leaves, and require farther study and revision. They probably indicate a somewhat milder climate on the Pacific coast than that which prevailed at the same time on the interior plains.

Additional specimens received from Mr. Monckton and Mr. C. Hill-Tout, while this paper was in the press, seem to confirm the identification of this species with Newberry's *S. Campbellii*, as described in his paper on Gibb's collections from Oregon, Boston Journal, 1863. In the Later Extinct Floras (Annals of Lyceum, 1868), he identifies this with other specimens from the Yellowstone; and as these are probably distinct, this may account for the change of name subsequently made. In these papers of 1863 and 1868, Newberry for the first time indicates the distinctness of the Tertiary flora of Oregon from the Cretaceous of Nanaimo. He naturally, however, following Heer, regards the former as Lower Miocene.

A specimen in Mr. Hill-Tout's collection shows the petiole smooth, as in Newberry's figure, and 4 centimetres broad, and fragments of the outer part of the leaf with the folds 3·5 centimetres broad and showing 24 parallel striations on each half, which would correspond to a leaf five feet or more in diameter. There is also a fragment of a stem, possibly of this species, and 9 centimetres in diameter.

Manicaria, sp.

A pinnate palm-leaf, with thick smooth petiole and pinnæ at first at a somewhat acute angle and bending toward a rectangular position. The specimens are from Burrard's Inlet, and are somewhat obscure. They bear some resemblance to Lesquereux's *Geonomites Ungeri*, but the leaves are at a less acute angle. They seem to have very fine and uniform striation. I have referred these leaves to *Manicaria*, owing to the thick rhachis and the position of the pinnæ, but better specimens are desirable, and there are in the collections many fragments of broad striate leaves which may belong to this or allied endogenous forms. A fragment in Mr. Hill-Tout's collection shows a petiole 5 centimetres in diameter.

Family CYPERACEÆ.

Some very interesting fragments referable to this family occur in the collections, and as these ancient *Cyperaceæ* are of especial interest and difficulty, they were placed in the hands of Prof. Penhallow, F.R.S.C., for study. He has kindly communicated the following notes:

"Specimens of sedge-like plants from the Tertiary, probably of Eocene beds at Stanley Park, near Vancouver City, collected by Dr. G. M. Dawson and submitted to me for determination by Sir Wm. Dawson, were found to embrace the carbonized impressions of both leaves and fruit, and in

some instances important structural features were presented in a very prominent manner.

"CYPERITES PAUCINERVIS, Heer.

"The leaves, represented by fragments upwards of 2 cm. in length, when highly carbonized present no structure whatever, but in other instances exhibit well-defined venation. They measure from 1·5 to 3 mm. in width. The midrib is in all cases obscure, but the nerves are prominent and upwards of eight in number. The venation shows no transverse union. These leaf fragments are in all cases entirely separate from their stems which, in fact, do not appear in any part of the matrix, while there is also no connection between them and the associated fruits. They may represent the foliage of either grasses or sedges, since they display no character by which they may be referred with certainty to either one family or the other, although the strongly-defined nerves may possibly incline us to regard them as more properly referable to the sedges.

"Lesquereux has already described one species of *Carex* (*C. berthoudi*) from the Tertiary of North America, but it differs materially from our specimen in its much broader leaves.[1]

"Heer has described a large number of Cyperaceous plants, under the genera *Carex*, *Cyperus* and *Cyperites*, from the Tertiary of Europe.[2] An examination of his figures and descriptions shows that, with respect to width and number of nerves, our specimen corresponds closely with his *Cyperites paucinervis*, which is also represented wholly by leaves, and to which the plant under discussion should be referred provisionally.

"CAREX VANCOUVERENSIS, n. sp.

"(Fig. 5.)

"The fruit is represented by a single spike which is terminal to a rather stoutish stem, and measures 14 mm. in length by 3·5 mm. in width. The individual fruits are ovate, acute, with a rather broad and rounded base, 1·25 mm. long and 0·75 mm. broad, but devoid of any obvious perigynia. They are disposed in two very regular lateral ranks, in which they are slightly ascending, while a third rank occupies a central position, but in it the fruits are foreshortened and compressed, and thus appear as round or shortly oval bodies.

"On each side of the erect spike is a very narrow carbonized line. These join at the base of the spike, and probably represent either two involucral bracts, or a floral bract and the extension of the floral axis

[1] U. S. Geol. Surv., Ter. Fl., p. 92, pl. ix. 1-4.

[2] Flor. Ter. Helv., i., 74, etc.; iii., 164-165.

from which the staminate spike has been removed. There are, however, no evidences of a structural nature which will permit final conclusion in this respect, and whatever deductions are drawn must be based upon other grounds.

"The character of the fruit, with its associated organs, makes it clear that it represents a Cyperaceous plant, and of one of the two genera, *Cyperus* or *Carex*. Assuming the two lateral organs to be foliar, then the fruit must be that of a *Cyperus*, in which case it is to be inferred that the additional spikes of the terminal umbel, so characteristic a feature of this genus, must have been removed by some mechanical process, or have become covered up in a lower stratum of the matrix—assumptions which would appear to exceed the limits of probability.

"On the other hand, the whole aspect of the spike is exactly that of a *Carex*, and if we assume the lateral organs to be foliar and cauline, one each, from the latter of which the staminate spike has been removed, as would actually be the case at the stage of growth represented by the specimen, then the correspondence to a *Carex* would be very close, and, among recent species, would find a close parallel in *Carex miliaris*.

"With respect to the possible identity of fruit and leaves, there is alone the extremely uncertain ground of association on which to base a conclusion, while, on the other hand, the obvious resemblance of the fruit to that of a *Carex*, and the resemblance of the leaves to previously described species of *Cyperites*, would amply justify their separate consideration.

"The genus *Cyperacites* of Schimper appears to be excluded from present consideration, since it embraces plants which are represented by leaves of great breadth, and of which the fruit is unknown.[1]

"The genus *Cyperites* of Heer[2] embraces upwards of twenty-four species which are represented, more or less fully, by all parts of the plant. The fruit is, however, never complete, and no one species satisfies the requirements of the specimen under consideration.

"Heer also describes several species of *Carex*,[3] among which the isolated fruits of *Carex tertiaria* bear a strong resemblance to those of our specimen. In no case, however, is the complete spike to be found, so that it would appear more reasonable to regard our specimen as one hitherto unknown, and for it we would suggest the provisional name *Carex Vancouverensis*."

CAREX BURRARDIANA, n. sp.

(Fig. 6.)

A third specimen from Burrard Inlet, near Vancouver, collected by Mr. C. Hill-Tout, appears also to differ very materially from any species

[1] Veg. Pal., ii , 412.
[2] Fl. Ter. Helv., i., 75, etc. ; iii., 164-155.
Fl. Ter. Helv., i., 74.

heretofore described. As shown in the figure, it is represented by a globular head of fruit having a total diameter of 12 mm. In detail, the head shows on one side the remnant of a stem, and otherwise is composed of a number (11) of fruit bodies, each of which shows an obvious outer sac or investment as a perigynium. These structures are rather narrowly ovate, beakless, but acute, or even somewhat acuminate and conspicuously two-nerved. Towards the centre there is a darker zone, in which the details are not clearly recognizable, but it is of such a nature as to suggest the presence of fruits internal to the perigynia. It is possible, also, that this appearance is in part due to the presence of floral scales. This zone merges at the centre into a darker region, which at once suggests a central axis or receptacle, an idea which gains force when it is found that the perigynia, with their inclosed fruits, clearly terminate at this zone.

From these details it would seem clear that we have here a Cyperaceous fruit of the genus Carex, which finds its modern representatives among those of the section Physocarpæ, and on looking over a number of herbarium specimens of this group, I find it not uncommonly happens that in pressing, the shorter, and, therefore, more globose, heads assume an appearance closely similar to that of the fossil.

None of the figures of fossil Carices, so far as I can ascertain, show any fruit at all similar to the one under consideration, and it would thus appear necessary to provide a provisional name, for which I would suggest *Carex Burrardiana*, the description reading as follows :

Carex Burrardiana, n. sp.

Heads globose, 12 mm. broad ; perigynia narrowly ovate, two-nerved, upwards of 2·25x6 mm., beakless ; the apex acute or somewhat acuminate. Associated with finely and many-nerved leaves about 1 cm. broad.

Populus balsaminoides, Goeppert.

(Figs. 8, 9.)

Goeppert, Flora von Schloss; Heer, Flora Helvetieæ; Flora Alaskana, p. 26, pl. ii. ; Lesquereux, U. S. Geol. Survey, vol. viii.

I refer the leaves figured to this species, though with some hesitation. I have, however, no doubt that they are at least identical with some of those referred to this species by Lesquereux. They resemble Heer's figures in form and venation, but differ in wanting the serration on the edges, or in having it very imperfect. Lesquereux's specimens were from Corral Hollow, California, and the Bad Lands of Dakota. Var. *latiloba* is credited to the Oligocene of Florissant.

The localities quoted above, if all the leaves referred to belong to one

species, show that it must have been widely distributed in Eocene times over the Northern Hemisphere, and extended upward into the Oligocene. With the exception of its cordate base, the leaves approach very nearly to those of *P. monodon*, Lesq., from Baton Mountains and Fischer's Peak.

Populus rotundifolia, Newberry.

(Fig. 10.)

One of the layers of the Hastings cores has cut around a leaf of this pretty little species so perfectly as to show nearly its whole margin. The species is characteristic of the Fort Union group, and is also found in the "Bad Lands." It is related to *P. arctica* and *P. cuneata*, which are found in the Oligocene of the Similkameen district.

Salix varians, Goeppert.

(Fig. 11.)

Goeppert, Flora Schloss; Lesquereux, vol. viii., p. 247.

In collections from Burrard's Inlet, also in those from Stanley Park, but the venation is not very distinct. It is a species credited by Lesquereux to Table Mount, California, and to Corral Hollow, Oregon, and is also found in Alaska in beds of Laramie age.

Salix integra, Goeppert.

(Fig. 12.)

Lesquereux, vol. vii., p. 107; vol. viii., p. 248.

Leaves referable by their form to this species are scattered abundantly over some surfaces at Burrard's Inlet. The venation is not well preserved. Similar leaves, though less abundant, appear in the collections from Hastings and Stanley Park.

Lesquereux finds this species at Black Buttes, Wyoming, and at Golden, Colorado, in Lower Tertiary. He also notes it at Corral Hollow, Cal., and *C. augusta*, a closely allied form, at Old Field, Oregon.

Dryophyllum Stanleyanum, s. n.

(Fig. 13.)

Quercus furcinervis? of Lesquereux, Geol. Survey of U. S., vol. viii.

Leaf thick, coriaceous, granulate on the surface, oblong, obovate, narrowing regularly below to the petiole. Midrib and veins strong, sunken in the leaf, which swells between the veins. Veins proceeding from the midrib almost at right angles, but bending upward toward the

margin, where some of them seem to fork obtusely, though this is uncertain. Margin entire or slightly undulate, so as to give a denticulate appearance.

This remarkable leaf is dominant in the collections from Stanley Park and Vancouver, and fragments occur in those from Burrard's Inlet. It seems probable that it is the species which Lesquereux identifies with *Quercus furcinervis* of Rossmassler, and found at Bridge Creek and Cascade Mountains, Oregon, and Plumas County, California. Some of its forms might, with some latitude, be referred to Rossmassler's species, but on the whole it seems distinct. In venation it somewhat resembles *Q. castaneopsis* of Lesquereux, from Randolph County, Wyoming, in beds supposed to be Oligocene. It differs, however, in form from that species. It seems doubtful if it is an oak, but perhaps may be referred for the present to the provisional genus *Dryophyllum*. It may eventually prove to be allied to the Laurels or Magnolias.

Quercus Dentoni, Lesquereux.

(Figs. 14, 15.)

Lesquereux, vol. viii., p. 48.

I refer these leaves to Lesquereux's species above named. They certainly represent a closely allied form. They are from Burrard's Inlet and Stanley Park. Lesquereux's specimens were from the Bad Lands of Dakota.

There are some fragmentary leaves in the collections which may have belonged to another species of Live-Oak.

Platanus, sp.

Large leaves, from Burrard's Inlet, having venation similar to that of *Platanus*, but too much crumpled and defaced to be figured or described. They seem to represent a form allied to the well-known species of *Platanus* so common in the Upper Laramie east of the mountains. A somewhat similar species, *P. dissecta* of Lesquereux, occurs at Corral Hollow, California, but in beds supposed to be of later date. Additional fragments show venation similar to that of *P. Gulielmi*, Heer, a well-known Tertiary species on both sides of the Atlantic, but unfortunately the margins of the leaf are not preserved.

Juglans denticulata, Heer.

Lesquereux, U. S. Reports, vol. vii., p. 289; Heer, Flor. Fos. Arct., vol. ii.

The specimens referred to this species are fragments found at Burrard's Inlet and at Hastings. It is characteristic of the Eocene flora of

Atanékerdluk, in Greenland, and is recognized by Lesquereux at Green River, Spring Cañon, and Carbon, in Lower Tertiary beds.

Found by Lesquereux at Green River, Spring Cañon, and Carbon.

ÆSCULOPHYLLUM HASTINGSENSE, s. n.

(Fig. 16.)

This is a fragment of the lower part of a large leaf from Burrard's Inlet. It is much crumpled and the margin is not well preserved, but it shows distinctly a septinate division into oblong leaflets, coming to a point below and articulated to the top of a common petiole. Traces of venation also show a resemblance to the modern Horse-chesnut, though the leaflets are narrower and the veins more curved. The genus *Æsculus* is represented in the Upper Laramie, east of the mountains, by a fruit (*Æsculus antiqua*) described by me in the Transactions of this Society for 1886.

FICUS SHASTENSIS ? Lesq.

(Fig. 17.)

Lesquereux, Bulletin U. S. National Museum, 1888.

This leaf, from Burrard's Inlet, resembles the above-named species in form and surface character, but the venation is not preserved. Lesquereux's specimens are from Shasta, California.

FICUS OCCIDENTALIS ? Lesq.

Lesquereux, U. S. Survey, vol. vii., p. 200.

Fragments of a broad-leaved *Ficus* occur in the Hastings collections, which are very near to this species. Similar fragments, but of smaller size and apparently narrower, appear in the collections from Stanley Park. They evidently represent a fine species of the genus near to, if not identical with, that named above.

Found by Lesquereux at Golden, Colorado.

PLANERA CRENATA, Newberry.

Newberry, unpublished plates communicated to me by Prof. Knowlton, of the U. S. National Museum.

This species is indicated by a leaf of which half is preserved on a surface of the Hastings core. Newberry's specimens are from Tongue River, Wyoming. I do not know the precise horizon.

This plant continued in British Columbia up to the Oligocene period, since it is found in collections recently made by Dr. G. M. Dawson at

Horsefly River, where it occurs in beds holding leaves of the Similkameen group. The original specimens contained in the Similkameen collections were referred by me to *P. elongata*, Lesq., but both forms occur together at Horsefly River, and possibly they are varieties of one species.

Miscellaneous Fragments.

The collections contain many fragments indicating the presence of additional genera and species. Some of them may belong to species of *Acer*, *Aralia* and *Betula*, and probably of other genera. The boring at Hastings, more especially, must have passed through some beds of shale exceptionally rich in well-preserved leaves. Should these beds ever be exposed by mining, they may be expected to yield a rich harvest of fossil plants.

One bed at Burrard's Inlet is crowded with roots of aquatic plants which resemble those found in the beds of the inland Laramie holding the leaves of *Lemna scutata*.[1]

In summing up the results of this study of fossil plants from the Tertiary of southern British Columbia, it appears, from a comparison with the flora of the Upper Cretaceous Nanaimo series, that the Burrard's Inlet species are distinct and of more modern aspect.[2] On the other hand, they are also distinct from those of the Oligocene or older Miocene deposits of the Similkameen district and other parts of the interior of British Columbia.[3] Between these they occupy an intermediate position; in this respect corresponding with the Laramie of the interior plains east of the Rocky Mountains. They also resemble this formation in the general facies of the flora, which is not dissimilar from that of the Upper Laramie or Fort Union group.

We may thus refer the plants now in question to the Paleocene or Eocene, and regard them as corresponding with those of the Atanékerdluk beds in Greenland, the lignitic series of the McKenzie River, and the beds holding similar plants in Alaska. Thus, the opinion expressed in 1890, from the very small collection then available, was substantially correct; and I find that the late Dr. Newberry had arrived at a similar conclusion from the study of the plants of the Puget group in Washington Territory.

This flora thus serves to fill up one of the gaps in our western series of fossil plants, namely, that between the Cretaceous and the Lower

[1] Flora of Laramie, Trans. R. S. C., 1887.

[2] Cretaceous Plants of British Columbia, Trans. R. S. C., 1882.

[3] Plants from Similkameen, etc., Trans. R. S. C., 1890.

Miocene. How completely it may fill this gap we do not know at present, since this would require large collections from all the beds of the group, and we can scarcely hope for these unless mining operations shall be carried on in the lignite beds. Workable beds of this kind have not as yet been found north of the United States boundary, but I do not despair of their discovery, though the superiority of the Cretaceous coal of the Nanaimo district may for some time prevent their development.

Should such opportunities be afforded for collecting these fossil plants, it is very desirable that accurate notes should be taken of the order of the beds containing the fossils, and also of their mode of occurrence, as it is to be expected that in a formation of so considerable thickness a succession of sub-floras may occur, and as the beds were probably deposited in the estuary of a river draining a large and elevated territory, differences of age may be complicated with the intermixture or alternation of species indigenous to the low country with others drifted from higher or colder districts in the interior.

It would be rash to attempt to decide definitely on the climatal conditions of the west coast of America in the Eocene period, from the plants yet known. But, so far as they can give information, we may infer that the Cretaceous climate was somewhat warmer than that of the Eocene, but that both attained a higher temperature than that of the present day in the same latitudes, while in the Miocene age the climatal conditions were not very different from those now prevailing in the region.

A collection of specimens made by Mr. Hill-Tout, of Vancouver, was received by the Geological Survey while this paper was in press. Notes on a few of the more important species have been introduced above, but there was not time to examine the whole of the specimens. On a hasty inspection they appear to include several forms noticed above, as *Salix varians*, *S. integra*, *Populus balsaminoides*, etc. There are also fragments referable to *Ficus Condoni*, Newby., *F. asiminifolia*, Lesq., *Quercus Evansii*, Lesq., and *Sequoia spinosa*, Newby. Other fragments indicate species of *Quercus*, *Juglans*, etc.

I have to thank Mr. L. M. Lambe, F.G.S., of the Geological Survey for the greater number of the figures.

LIST OF ILLUSTRATIONS.

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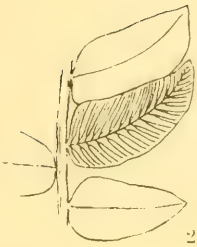
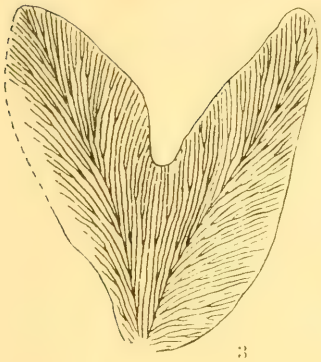
2—Neuropteris civica, s. n.
3—Lygodium neuropteroides, Lesquereux.
4—Asplenites, sp.
5—Carex Vancouverensis, Penhallow.
6—Carex Burrardiana, Penhallow.
7—Sabal Campbellii, Newberry.
8, 9—Populus balsaminoides, Goept.
10—Populus rotundifolia, Newby.
11—Salix varians, Goept.
12—Salix integra, Goept.
13—Dryophyllum Stanleyanum, s. n.
14, 15—Quercus Dentoni, Lesq,
16—Æsculophyllum Hastingsense, s. n.
17—Ficus Shastensis, Lesq.





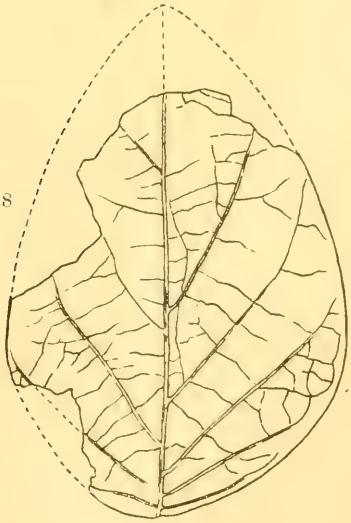


Fig. 1—Lastrea Fischeri.
3—Lygodium neuropteroides.
5—Carex Vancouverensis.
8—Populus balsaminoides.

Fig. 2—Neuropteris civica.
4—Asplenites.
6—Carex Burrardiana.

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Fig. 7—Sabal Campbellii.

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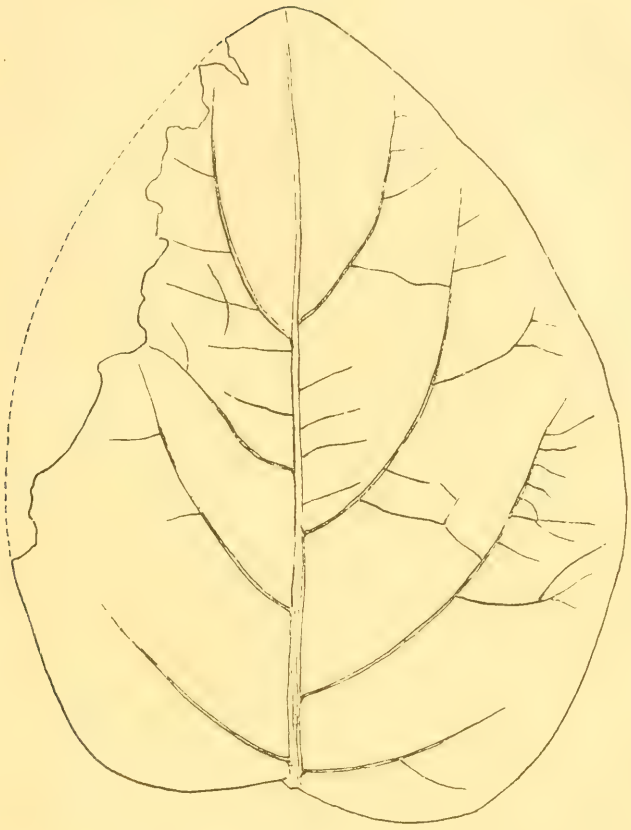

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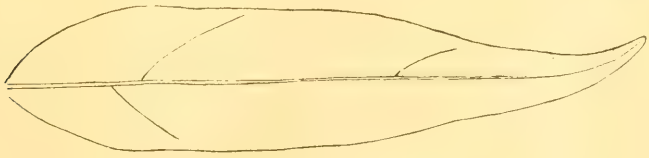

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Fig. 9—Populus balsaminoides.
11—Salix varians.

Fig. 10—Populus rotundifolia.
12—Salix integra.

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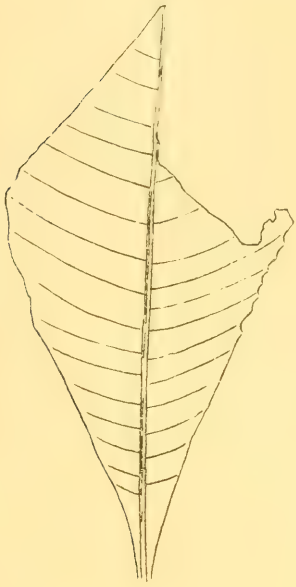

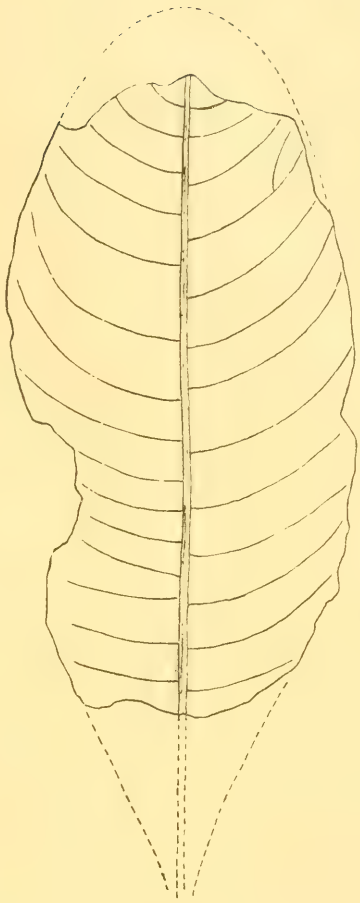

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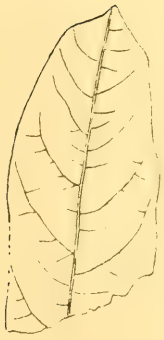

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Fig. 13—Dryophyllum Stanleyanum.
15—Quercus, sp.

Fig. 14—Quercus Dentoni.
17—Ficus Shastensis.

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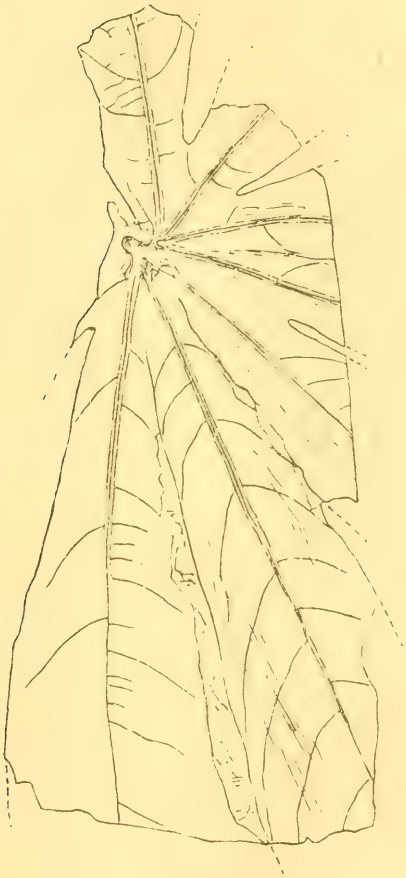

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Fig. 16—Æsculophyllum Hastingsense.

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VII.—*The Physical Features and Geology of the Route of the Proposed Ottawa Canal between the St. Lawrence River and Lake Huron.*[1]

By R. W. ELLS, LL.D., and A. E. BARLOW, M.A.

(Read May 15, 1895.)

The construction of a direct water way between the upper great lakes and the head of ship navigation on the St. Lawrence, by way of the French, Mattawa and Ottawa rivers and Lake Nipissing, is a problem of by no means recent date. At different times the project has come prominently before the Canadian public, and the comparative shortness of this route, as compared with the distance traversed by the Welland and St. Lawrence system, has always caused it to be regarded with much favour by many who saw in its completion a probable diversion of much of the immense traffic of the West and Northwest from its present course, and a corresponding lessening of freight rates, which would go far towards solving the question of the successful development of our great western heritage.

The route of the proposed canal as indicated has, until quite recent times, formed one of the most important and convenient avenues for Canadian intercourse and commerce. For hundreds of years it was the favourite means of communication between the tribes of the East and the West. But in 1615 that intrepid explorer, Samuel Champlain, urged on by the spirit of adventure, and under the guidance of his friendly Algonquin allies, boldly ascended the Ottawa and pushed westward to the height of land at the source of the Mattawa. Here he crossed the divide, and, sailing over the beautiful waters of the great Lake Nipissing, descended the French River to its outlet on Lake Huron, and thus earned for himself the proud distinction of being the first man of European descent to gaze upon the broad expanse of our vast inland seas.

This route having thus been made known, other courageous voyageurs and traders, led on by a like thirst for adventure or by the hope of gain, speedily followed along the track Champlain had so bravely pointed out; and during the period of the French régime in Canada this constituted the principal highway of communication between the scattered colonies along the lower St. Lawrence and the vast and almost unknown areas now known as Western Ontario and the Northwest. For many years subsequently it formed the principal channel for carrying on the business of the Hudson's Bay Company, whose line of forts or trading stations were distributed along its whole extent, at widely separated points. Along the waters of its several streams, and lake expansions also, the great brigades of boats and canoes passed year by year, bearing eastward the annual

[1] Published by permission of the Director of the Geological Survey of Canada.

harvest of valuable furs and carrying westward, into the otherwise pathless wilds of our vast interior, the various kinds of merchandise which formed the staple of trade with the savages of the great western wilderness. Up to comparatively recent years, when, through the advent of railway and steamboat communication, it has gradually fallen into disuse, it thus formed the main artery of traffic, the sheltered nature of its water stretches and the directness and shortness of the route recommending it at a time when the light birch canoe of the Indian trader formed the chief, and often the only, means of conveyance between the scattered hamlets of the sparsely settled country. These same potent reasons have likewise, in more recent years, been advanced by advocates of the projected through water-way, who saw in this route the most feasible line for an improved direct canal system between the waters of the great lakes and the St. Lawrence. Acting under instructions, therefore, from the Commissioner of Public Works, Mr. Walter Shanly, C.E., in 1856-57,[1] made a detailed examination of the route contemplated, and pronounced most enthusiastically in favour of the scheme. In 1858-59[2] another examination was made by Mr. T. C. Clarke, C.E., in accordance with instructions from the Commissioner of Public Works, and he also reported in favour of the undertaking. The details of the surveys and estimates of the expense can be found fully stated in the reports of these engineers.

The discussion of the proposed canal route naturally falls under two heads, viz., that which pertains strictly to the engineering problems involved, and in which the public at large are more directly interested, and, secondly, that in which the great problems of Archæan geology are presented. For the consideration of the latter, probably no better section is anywhere presented; since it traverses the great development of the older crystallines, nearly at right angles to their strike, for several hundreds of miles. For nearly half a century the limestones and gneisses of the area along the Ottawa and the rivers west to Lake Huron have been studied by some of the ablest geologists both of Canada and of the United States, and the great variety of rocks here presented, including the stratified gneissic and calcareous series, as well as the great variety of intrusives which are associated with these, furnish materials for the satisfactory solution of some of the most interesting and important questions in geological science. As for the engineering aspect of the question, it falls for the most part beyond the scope of this paper; but it is thought that a brief sketch of the principal physical features presented by the several

[1] Report of Walter Shanly, Esq., "On the Ottawa Survey," Toronto, March 22, 1858. Also, "Report on the Ottawa and French River Navigation Project," published by order of the Montreal Board of Trade, 1863.

[2] "Return of the Recent Survey and Report of the Engineers on the Ottawa Ship Canal," Quebec, 1860, Thos. C. Clarke.

rivers and lake expansions along the route proposed may be of general importance, since it presents, in a form readily available for reference, a mass of facts obtained not only from the earlier reports of the engineers who made the surveys but from careful personal examination as well. This, it is hoped, will render the discussion of the subject on any future occasion much more intelligible.

The total distance by the route proposed between Montreal and the waters of Lake Huron at the mouth of the French River is given by Mr. Clarke as only 430¾ miles, and this may, for convenience of description, be divided into two sections, viz., 1st, that along the Ottawa River itself from Montreal to the mouth of the Mattawa, a distance of 308 miles, and, 2nd, that along the Mattawa, Lake Nipissing and the French River, in all 122¾ miles.

Along the lower or Ottawa River section those portions of the system necessary to establish continuous communication between the cities of Montreal and Ottawa were completed nearly seventy years ago, and have ever since been regularly used in connection with the Ottawa and Kingston canal system. In this section is included the Lachine Canal, which was constructed to overcome the fall in the St. Lawrence above the city of Montreal known as the Lachine Rapids, in which the waters of the river have a descent of forty-four feet; 2nd, the Ste. Anne lock, near the junction of the Ottawa waters with those of the St. Lawrence, the fall here being only three feet, and the Carillon and Grenville canals, the improvements here extending over a distance of twelve miles and overcoming a total fall in the Ottawa River of fifty feet. The intermediate spaces, known as Lake St. Louis, Lake of the Two Mountains, and the long stretch of fifty-four miles between the head of the Grenville Canal and the foot of the Rideau Canal at Ottawa, have little or no current, and present no obstacles to navigation. The completion of these portions, therefore, has solved the practicability of the scheme for the first 116 miles of the distance.

No attempt has yet been made to overcome the interruption caused by the Chaudière Falls and the rapids above, where, in a distance of six miles, the waters of the Ottawa have a total descent of sixty-seven feet; but at the Chats Falls, which is the next obstruction at the head of the Lake Deschênes, twenty-eight miles further west, an attempt was made some years ago to overcome the barrier to continuous navigation there presented by the construction of a canal along the north bank of the stream. The total fall in the river at this place is fifty feet, the broken waters extending for quite three miles; but though a considerable amount of money was expended and excavations made along a considerable portion of the necessary distance, the project was never completed.

Passing the Chats Rapids, steamboat communication is continuous to the village of Portage du Fort at certain stages of water, the only diffi-

culty at any time being presented by the small rapid known as the Chenaux, about four miles below that place, where there is a fall of from eight to ten inches only in the ordinary stage of water in the river. This stretch brings us to the foot of the chain of rapids and falls known as the Darges, the Mountain, the Sable, and the Grand Calumet, the whole extending for a distance of ten miles, in which there is a total descent of ninety-three feet, and bringing us to the town of Bryson, on the north channel of the river past Calumet Island.

The river westward from Bryson presents no difficulties to steamboat navigation other than those caused by shifting sand-bars for about thirty miles, or to the foot of Allumette Island, which is at the upper end of Lake Coulonge. The shores of this portion of the river along the north channel of Calumet Island are generally low and composed of sand, with rock ledges at but few points; but the south or Roche Fendue channel is much more broken, heavy rapids and pitches occurring for some miles or to within about three miles of the head of the island. At the foot of Allumette Island two channels of the Ottawa unite. On the south channel the navigation is obstructed by two rapids, the Paquette and the Allumette, the former at the lower end of Allumette Island near the junction with the north channel, and the latter about three miles below the town of Pembroke. These present a well-defined barrier to the navigation of this channel, though the fall in either of the rapids is not of great amount; while in the north channel the obstructions caused by L'Islet and Culbute rapid and fall are overcome by a lock, constructed about twenty years ago, by which a total descent in the river of eighteen feet is overcome. By this means continuous steamboat communication is secured from Bryson to the foot of the Des Joachims Rapids, a distance in all of seventy-seven miles, and steamers ply regularly between the town of Pembroke and the latter point. The portion of the Ottawa for thirty miles below the Des Joachims Rapids is known as the Deep River, the stream flowing in a nearly straight course between generally lofty hills of reddish syenite and granitic gneiss. The water along this portion is generally very deep, and the river presents magnificent stretches of the grand scenery found in the Laurentian hills, resembling in this respect to a great extent the gorge-like aspect of the Saguenay.

From the Des Joachims to the forks of the Mattawa the distance is only fifty-two miles, and in this stretch the navigation is broken by the Joachim itself, with a fall of twenty-eight feet in two miles, above which the course is clear for sixteen miles to Rocher Capitaine rapid and fall, one of the finest in the river, the descent here being forty-five feet and the obstruction extending for two miles. In the stretch between these two rapids the waters of the stream have a fall of eight feet, in which is included McSorley's Rapid, with a fall of almost three feet, sufficient to impart a perceptible current, but otherwise offering no hindrance to con-

tinuous navigation. Ten miles above the Capitaine the three rapids known as the Trou, the Deux Rivières and L'Eveillé occur, extending for three miles, with a total descent of thirty-two feet. Between this and the junction with the Mattawa River three obstructions occur, viz., the Rocky Farm Rapid, with a rise of eight feet in five miles; Johnson's Rapid, with a rise of four feet in half a mile, and the Mattawa Rapids, with a rise of three feet, the latter just below the confluence of the Mattawa and Ottawa.

The Mattawa River though perhaps not the largest tributary of the Ottawa is nevertheless the most important and widely known. It may perhaps be best described as a succession of large deep lakes, united by comparatively narrow and shallow rocky streams. The total length from its junction with the Ottawa to the western end of Trout Lake which forms its head waters, in a straight line is about thirty-six miles, while following the course of the river this distance is increased to forty miles. The course is in general nearly east and west, following very much the same valley occupied by the Ottawa below the confluence of the two streams. At the junction, the Ottawa which above this has pursued an almost due southerly course turns abruptly to one not many degrees south of east, which course is maintained for a considerable distance below this point. The streams come together at the elbow thus formed, the Mattawa curving sharply northward at its immediate junction with the main stream. The mouth of the Mattawa comes out on a low flat point composed of sand, gravel and boulders. The southern bank of the river projects in a long narrow point which at low water stretches almost completely across the Ottawa leaving only a narrow though deep channel close to the base of the almost perpendicular cliffs of the northeastern shore. The position of this bar and the size and character of the material composing it, as well as its resemblance to other ridges of boulders which cross the Ottawa in many places throughout its course, would seem to indicate rather clearly its "morainic" origin.

This obstruction causes a considerable rapid which, with an accompanying swift current below, gives a fall of about five feet. The loose material causing the rapid next mentioned has doubtless been considerably modified, since its deposition, by alluvial action; and a rather well defined channel, which must formerly have served as an outlet for the water coming down from the west, runs through the flat point on which the village of Mattawa is built, reaching the Ottawa at the foot of the rapid just mentioned and about a mile below its present mouth.

Ascending the Mattawa, rapid water is encountered almost at once, the stream here flowing over a shallow bouldery bed. This, together with a small rapid a little over a mile above at the outlet of Boom Lake, gives a fall in the river of about two feet.

Boom Lake, the first expansion reached, is only about a mile and a

quarter long, and not over a quarter of a mile at its greatest width. At the upper or western end of this lake, the river is contracted in two places to a width of less than a hundred feet, and a fall of nearly twenty feet is occasioned by the Plein-Chant Rapids. The fall is in two descents with an intervening stretch of quiet water, the larger one near Boom Lake alone having to be "portaged." Lake Plein-Chant, at the head of these rapids, is a beautiful stretch of deep water, five and a half miles in length. The widest portion is near the eastern end, where it is about thirty chains, but this gradually diminishes westward till near the upper end it is not more than three or four chains wide. In the wider portion the sounding lead indicated a depth of over two hundred and eighty feet. Between this lake and Lac des Aiguilles, as the next expansion is called, the distance is a little over two miles and four rapids intervene with alternating stretches of still water, the combined fall of which is eighteen feet. The three largest rapids are known in ascending order as "Les Epines," "La Rose" and "des Rochers" or "des Aiguilles." The Amable du Fond River, the largest tributary of the Mattawa, enters from the south side a short distance above the second rapid. We next come to Lac des Aiguilles which is a little over a mile long and a quarter of a mile wide. It is separated from the next succeeding stretch of river lying parallel to it on the north side, by a rocky bar known as "Les Aiguilles" Islands. The three narrow rocky channels formed by these two islands even at high water barely afford a passage to loaded canoes. The eastern one constitutes the main connection, and a small rapid at this point shows a descent of a few inches. Above this we enter a long stretch of deep water which gradually diminishes in width as we ascend. The river throughout this distance of two and a half miles is flanked on either side by almost perpendicular walls of gneissoid granite, which, in the narrower places especially, give it the aspect of a beautiful natural canal. At the end of this stretch, the upward course of the river changes sharply to a southerly direction for about two miles, and the progress of navigation is obstructed by a series of rapids, with intervals of deep water, the total fall in this distance being fifty-five feet. The Chute des Paresseux, where the water of the river is precipitated in a beautiful fall thirty-four feet in height, is the first and greatest of this series of interruptions encountered in the ascent of the stream. Pimisi or Eel Lake, above these rapids, marks another change in the course of the stream, and from this place to the head of Talon Lake it maintains a northwesterly direction. Between Pimisi Lake and the Talon Chute the river flows for three-quarters of a mile through a narrow rocky cañon inclosed between perpendicular walls of granite. At the Talon Chute, which is the greatest single fall on the whole river, the water is precipitated a distance of forty-three feet over a rocky ledge composed of massive flesh-red gneissoid granite. The main channel is on the north side, but, in addition, there is another though much

smaller passage parallel to this, which, at high water, affords an exit to a considerable quantity of the water of the lake. The downward extension of this passage is continued in a deep gorge, which connects with the main channel a short distance below the falls, the whole apparently representing the erosion of a band of crystalline limestone or ophicalcite which here occurs associated with the granite. About half a mile above Talon Chute a small rapid occurs with a descent of less than a foot, and, a short distance westward, Talon Lake opens up to view. To the left, as we enter the lake, a large bay extends westward about three miles, known as Kabiskaw Bay, at the western extremity of which an important tributary (Kabiskaw Creek) enters, forming the outlet of Nasbonsing Lake, a large and irregular sheet of water situated in the southern part of the township of Ferris.

Lake Talon has a trend of northwest and southeast, is about seven miles long and has, in general, a breadth of almost three-quarters of a mile. The shores are frequently bold and rocky, although occasional small sandy flats occur, and one of these, known as Graswell's Point, on the northeast side about half-way up the lake, has always been a favourite camping spot. Shield's Point, near the lower end of the lake on the southwest side, is a tolerably level flat, composed chiefly of sand, gravel and other loose material. This point juts out into the lake, forming a bar where the water appears to be much shallower than in the rest of the lake. The general depth may be said to vary from fifty to one hundred feet, but in occasional spots a depth of two hundred feet and over was met with. The connecting stream between Talon and Turtle or Lower Trout Lake, as the next expansion in the river has been called, is about four miles. The stream leaves Turtle Lake about a mile from the eastern extremity. It is a shallow river often rocky and rapid with some small intervening ponds of deeper water. The upper part flows through a rocky defile, while the remaining half pursues a serpentine course through a sandy alluvial flat. On leaving the lake the stream assumes a northerly direction, but gradually curves around to the northeast, entering Talon Lake at the northwest end. This formerly constituted a part of the regular canoe route but is now seldom used, and scarcely a trace remains of what must at one time have been a well-beaten portage trail. The route now adopted leaves the eastern extremity of Turtle Lake over the "Portage de la Mauvaise Musique" to Lac des Pins, and thence, by a portage a little over half a mile in length, into a bay of Talon Lake about a mile below its upper end

Turtle or Lower Trout Lake as it is sometimes called, runs nearly east and west, and is about four and a half miles in length, although not more than half a mile at its widest place. An ascent of barely a foot occurs in a short channel, cut through boulders and other loose material, before the largest lake and the summit level of the river is reached. Trout Lake is a magnificent expanse of pure clear water often over two

hundred feet in depth. The shores, especially those to the north, are bold and rocky, and towards the western end many beautiful rocky islands dot its surface. It is eight and a half miles in length and the greatest breadth near the upper end is about two miles. At this place, however, the lake is divided into two portions by a bold rocky peninsula about four miles long, extending in an east and west direction, so that a large part of the lake is thus concealed from view. Towards the eastern end, the lake gradually tapers till the outlet is reached. To the north, a range of hills, from three hundred to four hundred feet high, runs with unbroken continuity to the mouth of the Mattawa River. The extreme west end of Trout Lake is only about three miles distant from the eastern shores of Lake Nipissing, and the neck of land separating the two lakes is in general very level, though bouldery, with numerous small lakes and ponds which apparently have the same elevation as Trout Lake, and which empty their waters into Lake Nipissing through Otchipwé Creek, and one or two other small creeks. Indeed, it is reported that a line can be chosen with one of the branches of Otchipwé Creek, which would show a summit level of less than three feet above the waters of Trout Lake. The canoe route usually followed however leaves the lake in a bay running to the south near the western end of the lake. The first portage runs over a ridge of sand, through which the solid rock may be seen protruding, about twenty-five feet above Trout Lake. The Rivière de la Vase is then utilized all the way to Lake Nipissing, a distance of a little over six and a half miles. This river or rather creek, for it is very small, runs through low and often marshy ground the most of the way, entering Lake Nipissing about six miles southeast of North Bay. Two alternative routes have been proposed for the canal through this isthmus, viz., 1st, that by way of the valley of Rivière de la Vase, and, 2nd, that by way of the Otchipwé Creek. The latter route seems to have a decided advantage both in regard to distance and cost, as it is only about four miles by this line. The canal would also have its entrance on a fine deep and unobstructed bay on Trout Lake, while it would reach Lake Nipissing in the immediate vicinity of North Bay, the most important town in the district. The land in the immediate neighbourhood of the Mattawa River, with few exceptions, is rocky and barren, and generally unfit for agricultural purposes. At the mouth of the Mattawa, and at several places immediately adjoining Lake Talon, a few isolated areas are under cultivation. A short distance from the river, however, in the townships of Papineau, Calvin, Bonfield and Ferris, considerable areas have been cleared, and good progress has already been made in the settlement of these townships. The townships to the north of the river are still uncleared, with the exception of portions of Widdifield, to the northwest of Trout Lake, where a considerable number of farmers have started to make homes for themselves. The country rises rapidly to the north of the Mattawa River,

the latter occupying a deep valley similar in character to that which contains the Ottawa, and the high steep hills which border both streams represent the edge of a large and comparatively level plateau, from three hundred to four hundred feet above the general level of the water of both streams. There seems to be no doubt that good sized tracts exist to the north of the Mattawa, which are well suited for farming purposes, but at present they are too inaccessible to be of much value.

Lake Nipissing is a large and important sheet of water having in general an east and west direction. The greatest length from the shore at East Bay, near Callendar station, on the northern division of the Grand Trunk Railway, to the western end of Bear Bay (West Arm) is sixty miles, while the greatest width from Beaucage Bay on the north to the mouth of the South River is sixteen miles. The northern and eastern shores of the lake are in general low, and, for the most part, present beautifully curving beaches of yellow sand separated by low rounded points of rock. The water for a considerable distance from the shore is shallow, and its approach is thus rendered more or less difficult and dangerous, especially during stormy weather. The western end of the lake possesses a most irregularly indented coast line; and many large arms or bays extend for miles to the westward filled with rocky islands. A great number of these islands stud the surface of the more open water outside, running in long lines more or less parallel, and usually in continuation of the peninsulas or points which divide the bays from one another. The islands vary in size from the small rounded rock, destitute of vegetation and often only exposed at low water, to some which are several miles in extent. The southern shores are bold and rocky, and the water very deep, even in their immediate vicinity. Occasional small coves between these rocks exhibit beaches of yellow sand or fine gravel. The whole of the eastern end of the lake is wide and exposed, containing only two small groups of islands, called respectively the "Manitou" and "Goose" Islands. The route from the mouths of either the Rivière de la Vase or Otchipwé Creek passes in the vicinity of the first-named group, the distance across to the mouth of the Southwest Arm, out of which the French River flows, is eighteen miles, which is unobstructed by rock or shoal of any kind. This Southwest Arm is about twelve miles in length and from one to two miles wide. It is filled with numerous islands and large and intricate bays extend to the west and northwest. From the most southerly of these bays the water finds its way into the lake-like expansion of the main river, about two miles northeast of the "Rapide du Pin."

The French River from the head of the Chaudière Falls, which mark the first obstruction in navigation to its mouth on Lake Huron, is forty-eight miles in length. It may best be described as a series of very long and comparatively narrow, though deep, lakes separated by rocky dams or bars, which impede the course of the water, thus giving rise to the

various falls and rapids. The water escapes by numerous rocky channels which bear a marked resemblance to one another. The presence of many of these was unsuspected, until the detailed survey made of the river by Mr. Alexander Murray of the Geological Survey in 1856. The two longest channels are known as the "North" and "South," and each of these is divided into an east and west portion. The old travelled canoe route utilizes the "South Channel East" in the upper portion of the river and the "North Channel West" in the lower portion, as they are nearly in line with one another and form the best and most direct course. This is the channel proposed to be followed by the canal, and it seems admirably adapted for the purpose as the natural obstructions present no great engineering difficulties. The presence of two or more channels would also materially aid in the prosecution of any improvement, as by damming an outlet the water below the dam would assume a lower level and thus enable work to be carried on to greater advantage.

The country in the vicinity of the French River is in general rocky and barren, presenting numerous more or less rocky hills or ridges, which are in no case of any great height, with intervening stretches of comparatively level land, which are usually occupied by swamps. There are occasional small tracts of good land, chiefly to the north of the river, but the shores are, as a general rule, bold and rocky. The Chaudière Falls are divided into two descents, separated by an interval of still water, the total fall being about twenty-six feet, and the whole length about a mile. At the Lower Chaudière the perpendicular rocky banks of the river are not more than fifty feet apart. Between the Chaudière Falls and the next interruption in the stream, "Rapide du Pin," the river widens into a lake about eight miles long, containing numerous islands. In general this stretch of water is from half a mile to a mile in width, although at one place opposite Bear Point it is scarcely a quarter of a mile wide. The outlet of the north channel, which, after a course of twenty-three miles, empties into the main channel about two and a half miles above "Grand Recollet Falls," is at the west end of a small bay extending to the northwest from above "Rapide du Pin." This rapid has a fall of 2·60 feet, and in the next four miles the stream is interrupted by as many rapids, which are known as "La Grande Faucille," fall 5·60 feet; "Rapide du Buisson," fall 3·30 feet; "La Petite Faucille," fall 4·40 feet, and "Le Parisien," fall 1·20 feet. A stretch of deep still water then ensues which is seventeen miles in length before the falls of "Le Grand Recollet" are reached. These are occasioned by a rocky bar which here extends across the river. In the next sixteen miles, before "Les Petites Dalles" are reached, as the last rapid on the river is called, there are only two small rapids. The first, about a mile below "Le Grand Recollet," shows a descent of scarcely a foot; while the second one, about four miles further down, has a fall of only two feet. Eleven and a half

miles below "Le Grand Recollet" Falls the river, which has heretofore had a direction a little south of west, changes abruptly to the south, which course is maintained for three miles further, when the route again changes to the west for one and a half miles, at which point the rapids known as "Les Petites Dalles" show a descent of six feet to the waters of Lake Huron. This brings us into a narrow inlet about two and a half miles in length, extending northward from Georgian Bay, and constituting the most westerly of the middle outlets of French River. The waters of French River empty into the northern end of Georgian Bay through a series of channels forming a curiously complicated rocky delta. It has been customary to designate these mouths as the "western," "middle" and "eastern" outlets. The western outlets are four in number, three of which empty into the eastern end of the inlet marked on the last chart (Commander Boulton, 1886) "Voyageur Channel," while the fourth, known as the "Mauvaise" or "Bad" River, reaches the lake nearly two miles east of this point. These channels unite in their upward course in a narrow lake about three miles from Georgian Bay, and continue together in a northeasterly direction for four miles, when the course suddenly changes to the east. The middle one of these three channels is the one pursued by canoes coming from the west, while canoes coming from the south, along the shores of Georgian Bay, generally found their way into French River by way of Henvey Inlet or "The Key," from both of which bays there is an easy portage routes coming out on the south channel of the French River opposite Cantin's Island. The eastern and middle outlets were therefore seldom used, and it is accordingly not surprising that so little was known with regard to them. The middle outlet consists of two rocky channels, which enter the lake within two miles of one another immediately north of the Bustard Islands. The eastern outlet consists of but one channel, which comes out in a bay about twelve miles east of the most western outlet. The middle and western outlets run in a north or northeasterly direction for five or six miles, when they intersect the lake-like expansion of the river known as "Lac le Bœuf," while the easterly outlet empties that portion of the river known as the "South Channel West" nearly two miles above its junction with the western part of the north channel. Before a decision could be arrived at in regard to the feasibility of this route for purposes of canalization, it was necessary that a detailed examination should be made to determine whether a suitable harbour could be found near the terminus on Lake Huron. Previous to 1856 the prevailing opinion was that such could not be found, and that the mouths of the French River were so beset by islands and rocky shoals that they could not be approached with any degree of safety by any craft larger than the ordinary bark canoe. An examination of the chart of Georgian

Bay (surveyed by Capt. H. W. Bayfield, 1822) seemed to strengthen these views; for while this plan revealed the western outlets of the river, coming out in a perfect labyrinth of bays, islands and rocky shoals, no notice whatever is taken of the eastern outlet, and the middle outlet was simply noticed as affording an exit for the water of a "large river." The detailed and accurate survey of Mr. Alexander Murray, in 1856, for the Geological Survey of Canada, and the later detailed and special examination of Messrs. Clarke and Shanly, revealed the fact that the most westerly of the middle outlets of the French River was excellently adapted for the purposes of a terminal harbour. In 1875 Mr. Ridout made a careful survey of this outlet in connection with his work of exploration for the route of the Canadian Pacific Railway. The soundings then taken showed a straight channel not less than a quarter of a mile wide and thirty feet deep from the lake into the bay into which this outlet empties. In 1879 Mr. E. P. Bender made a detailed examination of the French River with regard to its practicability for canal purposes, in connection with certain explorations for the Canadian Pacific Railway Company, and, as an indication of the sheltered position of this harbour, mentions the fact that many of the pickets planted near the water's edge by Mr. Ridout were still standing at the time of his visit. At the instance of the Marine and Fisheries Department, four lighthouses have been erected. Two of these are situated in line on the Bustard Rocks, to the west of the Bustard group of islands. Another has been built on Lefroy Island near the western entrance of the bay; while the fourth is situated on the eastern shore of the harbour itself, about a mile further north. The channel, though somewhat narrow, is straight and deep, and, with the lighthouses now in position, ought to be accessible to any of the vessels afloat on the great lakes.

The country traversed by the Ottawa is more diversified than that along the second or Mattawa and French river section. For while the Laurentian rocks may be said to form the chief geological feature of the area, the hills at various portions recede from the river, and the valley of the Ottawa itself is at times occupied with the recent sediments, which sometimes extend for several miles on either side. This feature is more particularly seen along that part of the valley between the Chats Falls and the city of Montreal, the country on either hand often being nearly level or broken by low rolling hills, and occupied by flat lying beds of the Potsdam, Calciferous, Chazy and Trenton formations which rest unconformably upon the upturned edges of the Laurentian gneiss and limestone. At two points only in this distance do the Archæan rocks cross the river, viz., at Rockland, twenty-five miles below Ottawa, and at Montebello, about twenty-five miles further east, where the characteristic crystalline rocks of the Laurentian show on the south bank of the river and are directly overlaid by the Potsdam sandstone. The banks of the river gen-

erally, along this part of the section between Ottawa and Montreal, are low and composed of marine clays. The long range of the Laurentian hills, intersected by the deep valleys of the Rouge, the Nation, the Lièvre and the Gatineau rivers, which are tributary from the north, rise in graceful contours in places, to elevations of 800 to 1,000 feet above the waters of the river; while to the south, the country is so generally level, that the South Nation River which joins the Ottawa, forty miles below Ottawa City, takes its rise within little more than a mile of the St. Lawrence, in the vicinity of Brockville. The soil in this area is for the most part excellent, though several extensive deposits of peat occur, destined probably at no very distant day to be of considerable economic value. Above the city of Ottawa to the Chats the nearly horizontal beds of the Calciferous and Chazy formations are well exposed, especially along the south shore, and in places contain extensive beds of limestone, excellently suited for building purposes. The rapids and falls of the Chaudière, at Ottawa itself, are caused by the heavy ledges of Trenton limestone which here cross the river and on which the city of Hull on the north, and, to a certain extent, Ottawa, on the south bank, are built.

Above the Chats Falls and rapids, which are produced by a rocky barrier of crystalline limestone intersected by several heavy dykes of syenite rock, the principal of which is seen to cause the Fall itself, the areas of these sedimentary rocks are quite limited till we reach the head of the Calumet Island channel. Beyond this however to the head of the Allumette Island and on the south side of the river adjacent, the beds of Chazy and lower Trenton have a very considerable development. Hills of granitic and syenitic gneiss rise on the north, almost from the shore of the river, while broad stretches of sand occur which overlie the marine clays of the district. From Pembroke west to the Mattawa these sands are widespread and occupy extensive areas, through which isolated masses of the syenitic and granitic rock protrude. Upon these latter also at widely separated intervals, outliers of fossiliferous Silurian strata are found, which have escaped the great denudation which affected the whole of this area.

It would appear from the presence of these sedimentary formations along the present channel of the Ottawa, that the valley itself must have been formed at a very early date, and in fact that it constituted a chief outlet for the drainage of these portions of the continent from early Archæan times.

Along the projected route of the canal system the summit level is found near the western end of the section at Trout Lake, 348 miles west of Montreal, or 82 miles east of the eastern terminus at the outlet of French River, in Georgian Bay, and the elevation here is 667 feet above sea level, that of the surface of Lake Huron being 581·3 feet; while the low water level of the River Ottawa, at the junction with the Mattawa, 308 miles west of Montreal, is 498·9 feet. The elevations for the various

stations along the entire route will be found in an appendix, in which the figures, as given in the reports of the canal engineers, have been carefully corrected by Mr. James White, chief cartographer of the Geological Survey Department, in accordance with the most recent hydrographic surveys.

Indications of changes of level in past times are readily observed at many points along the course of the Ottawa River in the presence of terraces, drift sands and clays and old river channels, which have since been closed through the accumulation of drift material, as sands and gravels, and the waters again diverted to their original course. Among these old water courses one may be noted at the Des Joachims Rapid to the north of the present river channel, which it reached by way of McConnell Lake and stream through the depression north of the village of Des Joachims itself. Another evidently turned off from the Deep River about fifteen miles below the Des Joachims Rapids, and extended by way of the Sturgeon Lake and Bay, into which the waters of the Chalk River now empty, thus cutting off the bold headland known as the Oiseau Rock on the Deep River and the high point at the sharp bend of the river below called High View. The banks of the Ottawa below the outlet of this old channel are composed of great masses of reddish sand, forming banks from twenty to sixty feet in height, which extend along the course of the stream for some miles. A second former channel evidently extended from the town of Pembroke, by way of the Muskrat River and Lake, from which the course can be traced by a series of depressions, dotted by a chain of lakes to the present channel on Chats Lake, near the Chenaux Rapids, several miles above the mouth of the Bonnechère. Opposite the city of Ottawa also another channel is seen in rear of the city of Hull; while it is probable that still another channel passed to the south of the city of Ottawa by way of the Hintonburg depression and Dow's Swamp into the present channel of the Rideau.

The deposits of sand and clay on the lower Ottawa are in places of great thickness, and show that the denudation of the old channel must have been very heavy. Between the Laurentian range at Lachute and the Lake of Two Mountains bore-holes have been sunk to a depth of 120 feet without reaching the underlying rock, while terraces of drift rise to the north of the boring to a height of from fifty to sixty feet, thus showing that the drift deposits must be not far from 200 feet in thickness at this place. The exposures of marine clay with characteristic fossils, found on Lake Coulonge, more than 200 miles west of Montreal, at elevations of 360 feet above the sea level, show that the waters of the ocean extended for a long distance inland during the period of depression.

The sedimentary Palæozoic formations found along the Ottawa River and in its vicinity include all from the Potsdam to the Lorraine shales which mark the summit of the Cambro-Silurian system. The greater part are well characterized by the fossils peculiar to each formation, and

the stratigraphical sequence can be well observed at various places. There does not appear to be any defined break throughout the whole series, though the estimate of their total thickness is affected to some extent by the presence of local faults. The basal beds of the lowest or Potsdam sandstone are in places made up of the débris from the Laurentian gneiss and limestone, while in other places the sandstones are penetrated by dykes of granite, which were formerly considered as integral portions of the Archæan rocks. The descriptions of these various divisions of sedimentary rocks are given fully in the earlier reports of the Geological Survey of Canada, and need not be here repeated.[1]

At several places along the Mattawa and Lake Nipissing portions of the route certain Palæozoic strata are also seen resting in almost horizontal beds on the hummocky surface of the pre-existing Archæan. A few of these outliers may be noticed at low water dipping from the edge of the gneiss, and forming a portion of the bed of the Ottawa River a few miles below Mattawa. The rock is a light gray arenaceous limestone, and the study of the few fossil remains which were obtained points to their being of Black River age. Strata representing the same period, and containing much more numerous and better preserved fossil remains, were also noticed on several of the Manitou Islands, in Lake Nipissing. The thickest section of these rocks appears to be near the southwest end of McDonald Island, the second in size of the Manitou group, where these rocks have a thickness of about thirty feet. The lowest bed exposed on these islands appears to be a coarse arkose made up of angular or subangular fragments of the subjacent gneiss, cemented together by a coarse sandstone or grit. This has no great thickness, and graduates quickly upward into a sandstone holding corals and fragments of what must have been in some cases very large orthoceratites. This in turn gives place to a gray limestone, which continues to the top of the series. Near the southwest end of Iron Island beds of a coarse sandstone or grit rest unconformably upon the gneiss, dipping at a very low angle to the west.

The Archæan rocks which form the great bulk of the strata throughout the entire area under consideration have been studied by various observers for three-quarters of a century. As early as 1821 Bigsby described the rocks north of Lake Huron as granite, gneiss, trap, etc., all of which were at that time assigned to the primitive formation. In 1827 the same observer also described similar rocks along the north side of the St. Lawrence in the vicinity of Quebec. Among subsequent early writers on these rocks were Sir Wm. Logan, Murray, Bayfield, Emmons and Hunt, while in more recent years Macfarlane, Selwyn, Vennor, Bell, Barlow, Lawson and others have added many important facts relating to their distribution, origin and general structure. The terms Laurentian and Huronian, given by Logan and Murray in 1852-54 for

[1] Geological Survey Report, 1845, W. E. Logan; 1851, A. Murray.

the two great divisions of the Archæan, have ever since been generally adopted by workers in this portion of the geological field.

A description of the crystalline rocks along the Ottawa River section and of the country adjacent was given by Sir Wm. Logan in his report for 1847. At that time they were regarded as, for the most part, of metamorphic origin, the supposition being that they were originally deposited like the sediments of later Palæozoic times. The principal rock mass was stated to be a red syenitic gneiss, with hornblende and mica arranged in a parallel direction. On the Madawaska River, a branch of the Ottawa in the south, a section of 1,350 feet was measured, which comprised gneiss, crystalline limestone and micaceous quartz rock, in which the calcareous members were in three bands and interstratified with the gneiss. The whole series at this point presented many of the physical features of altered sedimentary strata, and they were supposed to conformably overlie the great area of syenitic rocks more especially developed to the west. Both series were intersected by clearly intrusive granitic and pyroxenic dykes and veins.

In 1852 the series of crystallines north of the Ottawa and St. Lawrence was examined, and in 1857 the report of Logan on the areas west of Montreal was published. These rocks, consisting of gneiss, limestone, quartzite and anorthosite, were all styled metamorphic sediments, following the principles enunciated in the earlier report on the area to the west. The presence of eruptives, such as syenite, porphyry, diorite and trappean rocks of various kinds, was noted, but all these were regarded as older than the Potsdam sandstone, which at various points was observed to flank the base of the Laurentian hills. In this series also the anorthosites were considered as being an associated division of the limestones, and as possibly belonging, with them, to one great undulating mass. It was not, however, till the publication of the Geology of Canada, 1863, that anorthosites or Labradorite rocks were stated to form the upper member of the Laurentian series, being there said to probably constitute an upper unconformable division to the crystalline limestone, with an approximate thickness of 10,000 feet. This area of rocks north of the lower Ottawa was styled the Grenville series,[1] and was regarded as representing most completely the structure of the oldest crystallines of Canada.

In the meantime Logan's co-worker, Murray,[2] described the usual series of gneisses, crystalline limestone and quartzite of the Thousand Islands and of the mainland to the north, with associated areas of what he regarded as conglomerates, the latter being held to be conclusive evidence of the sedimentary and metamorphic character of the whole. In 1853[3] he made a traverse from Lake Huron by way of the Muskoka and

[1] Geological Survey Report, W. E. Logan, 1853-56.
[2] Geological Survey Report, A. Murray, 1851-52.
[3] *Ibid.*, 1853-56.

Petawawa rivers to the Ottawa, a route approximately parallel to that by the Mattawa and Ottawa, and, in the ensuing year,[1] he made further explorations in this area by a traverse towards Lake Nipissing along the Meganatawan River. In 1855 he completed the examination of this section by the exploration of the Nipissing and French River route.[2] In his descriptions of the several sections then examined Murray enumerates the usual variety of red and gray gneiss, micaceous and hornblendic schists, quartzite and crystalline limestone, as well as certain areas of reddish syenitic rock, in which the stratification was entirely absent or very indistinct, which were regarded as probably intrusive; while the country rock generally was held to be metamorphic. The whole series was found to be everywhere corrugated, often with steep bends and folds, and intersected by quartzo-felspathic dykes and quartz veins.

The gradual evolution of the problem of the composition, origin and structure of these oldest Laurentian rocks which were so extensively studied by Logan, Murray and Hunt prior to 1863, required much careful study, both in the field and laboratory. The difficulty of arriving at satisfactory conclusions in the field at that early date can be scarcely appreciated at the present day; since forty years ago much of the area covered by the Laurentian rocks was accessible only with great trouble and expense, while the men skilled in the interpretation of such a complicated geological structure as was thus presented were few. The problem undertaken by these pioneers in Canadian geology was not only new but one of exceeding difficulty, yet the results then arrived at, with the limited means at their disposal, have been accepted as conclusive by most workers in this field for many years. The more recent field work of Lawson[3] on these rocks as developed to the west of Lake Superior about the Lake of Woods and elsewhere, and by Barlow[4] in the country north of Lake Huron, gradually led to the conviction, on their part, that much of what had been regarded as the oldest member of the Laurentian, viz., the syenitic gneiss, destitute of limestone, was of more recent age than the stratified gneiss and limestone series with which they were associated; and that, in fact, these had been intruded into the gneiss at a date subsequent to their deposition.

An examination by Dr. F. D. Adams in 1885-86, of the great anorthosite areas of Morin and the townships adjacent, which had been regarded as the upper part of the Grenville sedimentary series, led him also to the conclusion that these could no longer be regarded as altered sediments but that the anorthosite was clearly intrusive through the Laurentian

[1] Geological Survey Report, A. Murray, 1853-56.

[2] *Ibid.*, 1853-56.

[3] Geological Survey Report, vol. iii., new series (F), A. C. Lawson, 1887-88, "On the Rainy Lake region."

[4] American Geologist, vol. vi., pp. 19-32 (July, 1890); Bulletin G. S. A., vol. iv., pp. 313-332.

limestone and associated stratified gneiss, and consequently of more recent date. These examinations extended over several years and embraced large areas both to the north of Montreal and in the Quebec and Lake St. John district, and the results arrived at by Dr. Adams as to their eruptive character, based upon an exhaustive study, both in the field and by the aid of the microscope, must be taken as conclusive on this subject.[1] Thus the study of the Laurentians both on the extreme east and west of the typical area has strongly tended to establish the opinion that many of the usually accepted views as to the structure and origin of the syenitic and granitic gneiss and of other portions of the great Archæan complex require to be very considerably modified.

In the consideration of a question of such great extent and of such complexity as that of the origin and structure of these ancient crystallines presenting as they do such variety in composition and physical character, with such diversity of relations, it is to be feared that much of the apparent discrepancy of opinion has arisen from the attempt to solve the problem by a study of too limited an area, or from a too rapid generalization from insufficient data, too often obtained from unreliable sources The methods of study of the older crystallines and eruptives also have materially changed during the last twenty years; and the revelations of the microscope have thrown much light upon questions which for a long time were perplexing in the extreme. Thus it has gradually come about that much of what, in the early days of the study of this series of rocks, was considered from their physical characters, chiefly of aqueous origin, has been clearly shown to have originated in an entirely different manner, and that many of these rocks, formerly supposed to be sedimentary, are, in fact, truly igneous masses. While many differing views have been expressed by the several workers in this very interesting geological field, it may be stated that the Grenville series or the original typical Laurentian area of Logan probably most fully illustrates the most perfect section of the Laurentian rocks which we can yet recognize. This section embraces a great variety of rock structure. It includes the various kinds of gneiss, foliated and stratified, with foliated and massive granites and syenites, pyroxenic and dioritic, hornblende and quartzose rocks, quartzite and limestone. In the basal beds of the latter are interstratified bands of rusty quartzose gneiss which, from the evidence yet at our disposal, form an integral part of the calcareous formation. This portion presents in its banded arrangement of quartzose and calcareous rocks, the usual aspect of true altered sedimentary strata. The same well banded arrangement is also visible in some of the directly underlying gneiss; but in the case of the great mass of this gneiss, the microscopic examination shows the evidence of an aqueous origin to be wanting. Whatever may

[1] "Ueber das Norian oder Ober-Laurentian von Canada" aus dem Neues Yahrbach für Minerologie, etc., Beilageband, VIII., Stuttgart, 1893.

have been their origin however, the alteration into the gneissic and crystalline condition must have been completed prior to the deposition of the sedimentary Cambrian or other rocks which now rest upon them, since in the case of the Potsdam formation, and, in fact, of many of the beds of the lower Cambrian, there is but small indication of a gneissic or crystalline structure, except where this has been produced directly through local causes. That there has been a subsequent crystallization or metamorphism, even in the crystalline limestone of the Laurentian, is clearly evidenced by the presence of intrusive masses of diorite, syenite or granite which have developed crystals of mica, graphite and other minerals along the line of contact. Through the same cause also the limestone itself in places is changed to an ophicalcite by the formation of grains of serpentine through the crystalline mass.

While it is now clearly established that some portions of the igneous rocks of the Laurentian area, as developed in the area along the Ottawa, are of more recent age than the crystalline limestones which are supposed to constitute the upper member of the series, certain other portions are undoubtedly older, and these most probably represent the lowest portions of the earth's crust known to us. These oldest gneisses are foliated rather than stratified ; but in their foliation they underlie the regular series of stratified hornblende and other gneisses which occur frequently between the fundamental gneiss and the crystalline limestone and quartzite series at the summit of the sections. To this fundamental series may be assigned the rocks of the Trembling Mountain which were assumed by Logan to constitute the lowest member. Similar rocks occur as anticlinals north of Lachute, and at different places throughout the Grenville district, while large areas occur at various points along the upper Ottawa river section. Concerning much of the intermediate gneisses, it may be said that while in their general aspect they resemble stratified sedimentary rocks, their study under the microscope shows them to have presumably a different origin, so that it is possible that the true altered aqueous portion may be confined to the areas of crystalline limestone with their associated bands of quartzite and grayish quartzose and hornblende gneiss. But concerning this latter series it must also be said that a considerable diversity of opinion already exists, some regarding the sedimentary origin of these rocks even to be an open and doubtful question.

The crystalline limestones are particularly developed in the Ottawa River section from the vicinity of the Deschênes Lake, west of Ottawa city, to the village of Bryson. Here they form a tolerably continuous belt extending along the river for many miles, though their continuity is frequently broken by the presence of large areas of intrusive granitic and dioritic rocks. This portion of the section would, therefore, appear to represent the highest members of the Laurentian proper, and at one

place, near the Chats, it is overlaid by a considerable breadth of Huronian-looking rocks, schists, etc., which have been described in earlier reports under the name of Hastings series. The crystalline limestone portion of the Laurentian has its most westerly outcrop on the river in the vicinity of the Coulonge Lake, a short distance west of the Black River, the rocks further westward being for the most part granitic gneiss, granite and syenite, to the mouth of the Mattawa. In that portion of the Ottawa River section east of Ottawa city the limestones occur rather as separate bands occupying generally synclinals in the upper stratified gneisses, which form in many cases well-defined anticlinals, and in certain sections of this area these anticlinals are repeated very frequently, presenting thus the aspect of a ridged structure, in which the inclination of the strata is generally at a high angle.

The rocks exposed along the route of the Mattawa and French rivers to Lake Huron are chiefly what have been regarded as Laurentian gneisses. There is, however, a general absence of crystalline limestones, which forms such an abundant constituent of the Laurentian further east; and this, as well as the apparent inferior position of the gneisses themselves, caused them at an early date to be placed at the very base of the geological series, thus constituting the Lower Laurentian of Logan and other early Canadian geologists.

Crystalline limestone is only very sparingly present in association with these gneissic rocks of the Mattawa section, and wherever noticed the evidence all seemed to point to the fact that it had been "caught up" by the gneiss during the irruption of the latter. On the south shore of Talon Lake, as well as in the southern channel of the falls at the outlet of this lake, a crystalline limestone was noticed in conjunction with a very massive red foliated granite. Although in many places the bedding of this limestone corresponds with the planes of foliation of the inclosing rock, still at one place on the north bank of the river, a short distance above the falls, the limestone is seen to be in unconformable juxtaposition, the bedding of limestone abutting against the foliation of the granite. The line of junction is irregular and jagged, and the granite itself shows a much finer texture near the line of contact The limestone contains a good deal of serpentine in small spots and patches, and would form excellent building stone as well as good material for burning for lime.

Crystalline limestone was also noticed on the east shore of the Great Manitou or Newman Island, in the eastern part of Lake Nipissing, as well as on two of the smaller islands composing this group. The limestone occurs associated with a massive red gneissic rock composed chiefly of a deep red felspar and a dark green chloritic material, the arrangement of the latter in approximately parallel bands and streaks, giving it a rather distinct foliation. The limestone is generally of a beautiful pink colour, and exhibits abundant small scales and crystals of biotite or

fibrous radiating crystallizations of a dark green hornblende. It occurs in rather small quantities, and, like the Talon Lake limestone, seems to have become incorporated in the gneiss during its irruption. On Iron Island, in Lake Nipissing, small patches of a dark coloured crystalline rock, containing a large proportion of calcite, has been sometimes described as a crystalline limestone, but an examination under the microscope reveals its irruptive character, the large quantity of calcite present resulting from the decomposition of the plagioclase originally present.

It is not possible here to go into the various theories in regard to these ancient crystalline rocks, but it may be well to mention certain facts in this connection. It may be safely stated that the old belief that the whole of these gneissic rocks represent ordinary aqueous sediments which have undergone such extreme metamorphism as to mask their original character, is now entertained by few geologists. The "basement complex," as it has frequently been called, has been shown to be composed of a great variety of rock types whose sole resemblance consists in the more or less parallel disposition of their component minerals. The excellent work of Professor Lehmann on the gneisses of Saxony gave a fresh stimulus to the study of these old rocks, and the rapid advances lately made in the science of petrography have caused geologists to take a fresh interest in them.

The work of Dr. A. C. Lawson, for the Geological Survey of Canada, in the Lake of the Woods and Rainy Lake districts, already referred to, accompanied by an extensive microscopical examination of the rocks of these districts, as well as the detailed petrographical studies of the late Professor G. H. Williams in the Menominee and Marquette region of Michigan, defined clearly the fact that the foliation or lamination of these crystalline rocks does not necessarily imply an original bedded character, but in most instances has been the result of the enormous mechanical stresses to which these rock masses have been subjected. The studies of both these observers in the field, as well as in the laboratory, led them to the belief that many of the crystalline rocks, which had formerly been regarded as altered sedimentary strata, were in reality of irruptive origin, and distinctly referable to the more commonly massive plutonic rocks.

The foliation noticed in these gneisses is produced either by (1) the alternation of light and dark bands, or (2) by the more or less parallel distribution of the component minerals. In many of the plutonic or deep-seated rocks, particularly the granites and similar allied types, a marked tendency is noticed in the bisilicates to aggregate themselves in certain spots or patches, leaving the rest of the rock mass comparatively free from these constituents. The dark spots (*Ausscheidungen*) so conspicuous in many granites are perhaps the most familiar examples of this "magmatic differentiation," as it has been called. A microscopical examination of these "spots" shows that they possess the same mineral constituents

as the surrounding rock, and differ only in the relatively greater abundance of the bisilicates present—indeed felspar and quartz are only sparingly represented, if at all. As the basic constituents are the first to cool and to assume a crystalline condition, these segregations mark the first formed nuclei in the slowly cooling magma. The result of pressure on a rock, characterized by the presence of these masses would result in their being squeezed or drawn out into more or less lenticular areas, assuming an approximately parallel position to one another in a direction at right angles to the pressure.

Again, many of the dark bands present in these gneisses are seen to have had their origin as dykes which have been intruded in a direction corresponding to the foliation, as offering the least resistance. The origin of many of these dykes of hornblendic schist may very often be clearly made out in the field, as they can be frequently traced along their strike into areas or residual cores of the unaltered massive diorites or diabases which for some reason have escaped the pressure or deformation to which the surrounding rocks have been subjected. In the case of the more massive of these gneisses where the foliation is produced by the approximately parallel position of the mineral constituents, their field relations, as well as their microscopical characters and chemical composition, reveal their true nature as irruptive granites which acquired a foliation as a result of pressure. In fact at the present time petrographers have abandoned the use of the term "gneiss" as applicable to any definite type of rock, and are inclined to make use of it in a structural sense only or as a term of convenience when nothing very positive is known in regard to the constituents of the rock.

It has been conceded that many of the plutonic rocks, such as granite, diorite, etc., may, and, in fact, often do exhibit a tendency to a more or less parallel disposition of their component minerals so that it has now become customary where a rock has been subjected to examination, to speak of it as a gabbro-gneiss, diorite-gneiss, etc., in this way at once indicating the composition and texture of the rock mass.

Recent work in Archæan geology has likewise shown that a great deal of this gneiss has not only had an irruptive origin but was in a molten or a plastic condition at a time subsequent to the hardening of certain distinctly clastic rocks with which it came in contact. At what depth below the surface these rocks must have solidified to produce their perfect crystalline condition is a matter of conjecture. Moreover, no certain evidence has been produced of the existence of any surface volcanic rock with which they might most reasonably have been expected to be associated, although subsequent denudation and erosion may have removed all traces of such mantle or covering. Although in many instances this first formed floor has been shown by its contact with the Huronian clastics to have been in a very unstable condition, still in a great many cases its present

attitude with regard to the overlying clastics may, and doubtless has been, maintained since its original formation. In the country immediately adjoining the Mattawa River, and in the eastern part of Lake Nipissing, the gneiss is usually very distinctly foliated, although in many cases large areas are characterized by the presence of the more massive and granitoid varieties, in which cases the foliation is often more or less obscure and occasionally absent altogether. The dip is generally to the south at a high angle; but near the outlet of the French River from Lake Nipissing, and for a considerable distance down the river, the gneiss is either horizontal or inclined at a very low angle to the south. As Lake Huron is approached, however, the gneiss is again tilted up, and displays a remarkably uniform dip in a southeasterly direction at a comparatively high angle. On a map shortly to be issued by the Geological Survey (as well as on some others previously issued) the attempt has been made to correlate the many apparently conflicting strikes obtained through this district, and to show by means of certain lines the curious curving and twisting affected by this gneiss.

A large number of dykes cut these gneisses, but no petrographical examination has yet been made of their contents. A rather remarkable and unusual dyke, about ten feet wide, was noticed cutting across the strike of the foliation of the gneiss on the most southerly of the Manitou Islands. The rocks comprising the dyke resemble in a striking manner the alnöite rock described by Dr. F. D. Adams as occurring at Ste. Anne's, on the Island of Montreal. Dykes of fine-grained felsite and veins of pegmatite are, as usual, tolerably abundant.

The following levels are based on a list published in 1860 by Thos. C. Clarke, C.E., in a Report on the Surveys of the Ottawa Ship Canal, addressed to the Hon. Commissioner of Public Works. His starting point, Lake St. Louis, is assumed as 57 feet above the sea, whereas the latest levelling of the Public Works Department gives it as 72·47 feet, that is, 15·47 feet higher. This correction, after deducting 1·10 feet from Clarke's estimate of the rise between Ottawa and Grenville, would give an elevation of 588·37 feet for Lake Huron, as compared with 581·28 feet, the latest determination of the U. S. Coast Survey, or 7·09 feet too high. This difference has been spread proportionately over the total rise and fall between Ste. Anne's and the mouth of the French River. As a proof of the general accuracy of the levels thus deduced, it may be mentioned that the elevation given herein for Lake Nipissing is the same as that given by the corrected levels of the Northern Pacific Junction Railway (now part of the Grand Trunk Railway), and the elevation of the mouth of the Mattawa River also agrees with that deduced from the profiles of the Canadian Pacific Railway.

J. WHITE.

Miles from Montreal.	MONTREAL TO MATTAWA.	Rise—Low Water Section.	Elevation above Mean Tide at Quebec, Low Water.	Elevation above Mean Tide at Quebec, High Water.	Difference between High and Low Water.
	Montreal Harbour—opposite Longueuil	.....	25·45	40·62	15·17
	" " " Round Island	.....	25·45	41·20	15·75
	" " at Victoria Bridge	8·55	34·00	42·00	8·00
	Lake St. Louis	38·47	72·47	80·36	7·90
22·00	Lower Ste. Anne	.....	72·47	79·0	6·50
22·10	Upper Ste. Anne	1·00	73·5	82·5	9·00
47·70	Carillon Rapids	1·00	74·5	86·5	12·00
49·00	Above Carillon Rapids	8·65	83·15	93·1	10·00
53.00	Chute à Blondeau Rapids	·05	83·2	95·2	12·00
53·10	Above Chute à Blondeau Rapids	3·95	87·15	102·35	15·20
54·50	Foot of Long Sault Rapids	·10	87·25	103·65	16·40
60·43	Grenville	45·30	132·55	147·35	14·80
116·50	Ottawa Harbour {Rise estimated at 1·20 ft.}	1·20	133·75	153·75	20·00
	Above Chaudière Falls	41·85	175·6	183·6	8·00
118·50	Above Little Chaudière Falls	8·00	183·6	190·6	7·00

Miles from Montreal.		MONTREAL TO MATTAWA.	Rise—Low Water Section.	Elevation above Mean Tide at Quebec, Low Water.	Elevation above Mean Tide at Quebec, High Water.	Difference between High and Low Water.
		Above Remoux Rapids	2·80	186·4	194·4	8·00
122·86		Deschenes Lake	9·70	196·1	204·1	8·00
149·55		Foot of Chats Falls	·30	196·4	206·4	10·00
150·05		Above Chats	37·60	234·0	238·0	4·00
153·16		Chats Lake	11·70	245·7	252·7	7·00
171·13		Foot of Chenaux Rapids	·20	245·9	252·9	7·00
171·33		Head of Chenaux Rapids	·60	246·5	256·5	10·00
175·73	Calumet Channel.	Portage du Fort Rapid	1·80	248·3	258·3	10·00
		Head of Portage du Fort Rapid	12·90	261·2	270·2	9·00
181·33		Mountain Rapid	6·10	267·3	277·3	10·00
		Head of Mountain Rapid	13·20	280·5	293·5	13·00
		Head of Dargies Rapid	1·70	282·2	.....	.....
		Foot of Calumet	5·60	287·8	297·8	10·00
184·14		Head of Calumet	55·10	342·9	351·9	9·00
202·20		La Passe	4·20	347·1	357·1	10·00
175·73	Roche Fendue Channel.	Portage du Fort Rapid	.....	261·2	270·2	9·00
183·00		Roche Fendue Falls	·50	261·7	271·7	10·00
184.50		Long Rapids	6·30	268·0	277·0	9·00
186·00		La Barrière	16·20	284·2	296·2	12·00
187·00		Muskrat Rapid	3·20	287·4	296·4	9·00
188·00		Mice Rapid	6·80	294·2	303·2	9·00
188·50		La Fontaine's Lake	3·20	297·4	305·4	8·00
189·50		Black Rapids	18·50	315·9	325·9	10·00
190·30		Black Falls	17·65	333·55	343·55	10·00
192·00		Flat Rapids	11·85	345·4	355·4	10·00
195·92		La Passe	1·70	347·1	357·1	10·00
206·60		Foot of Allumette Island	2·55	349·65	360·65	11·00
215·43		Foot of Chapeau Rapids	·75	350·4	361·4	11·00
215·50		Head of Chapeau Rapids	·60	351·0	362·0	11·00
220·35		Foot of l'Islet Rapids	·60	351·6	362·1	10·50

Miles from Montreal.	Montreal to Mattawa.	Rise—Low Water Section.	Elevation above Mean Tide at Quebec, Low Water.	Elevation above Mean Tide at Quebec, High Water.	Difference between High and Low Water.
221·10	Head of Culbute Rapids	16·90	368·5	375·5	7·00
226·40	Fort William	·30	368·8	375·5	6·70
254·00	Head of Deep River	1·30	370·1	379·9	9·80
255·64	Head of Des Joachims Rapids	26·10	396·2	413·2	17·00
263·30	Mouth of Dumoine River	1·00	397·2	414·9	17·70
268·25	Foot of McSorley's Rapids	3·00	400·2	.....	.....
269·00	Head of " "	2·90	403·1	.....	.....
272·50	Foot of Rocher Capitaine Rapids	2·90	406·0	.....	.....
273·85	Head of " " "	40·45	446·45	460·45	14·00
285·55	Foot of Deux Rivières Rapids	4·25	450·7	466·3	15·60
286·01	Head of " "	12·50	463·2	.....	.....
286·70	Foot of Trou Rapids	·80	464·0	.....	.....
287·15	Head of " " (at Micmacs)	7·30	471·3	488·7	17·40
288·10	Foot of L'Eveillé Rapids	2·80	474·1	.....	.....
288·70	Head of " "	7·40	481·5	.....	.....
296·75	Foot of Rocky Farm Rapids	·40	481·9	.....	.....
301·50	Head of " "	8·40	490·3	.....	.....
306·55	Foot of Johnson's Rapids	·80	491·1	.....	.....
307·00	Head of " "	4·80	495·9	.....	.....
307·60	Foot of Mattawa Rapids	·10	496·0	.....	.....
308·00	Head of " "	2·90	498·9	513·2	14·30
308·00	Mouth of Mattawa River	.....	498·9	.....	.....
	Mattawa and French Rivers.				
308·00	Mouth of Mattawa River	.....	498·9	.....	.....
310·40	Foot of Plein Chant Rapid and Chute	5·40	504·3	.....	.....
310·80	Foot of Lac Plein Chant	16·70	521·0	.....	.....
316·25	Foot of Des Epines Rapids	·20	521·2	.....	.....
316·30	Head of " "	5·50	526·7	.....	.....
316·85	Foot of Rapide de la Rose	·20	526·9	.....	.....

Miles from Montreal.	MATTAWA AND FRENCH RIVERS.	Rise—Low Water Section.	Elevation above Mean Tide at Quebec, Low Water.	Elevation above Mean Tide at Quebec, High Water.	Difference between High and Low Water.
317·00	Head of Rapide de la Rose	5·55	532·45	.....	.....
318·20	Foot of Rapide des Rochers	1·35	533·8	.....	.....
318·30	Head of " "	4·80	538·6	.....	.....
319·00	Foot of Rapides des Aiguilles	·10	538·7	.....	.....
319·01	Head of " "	·40	539·1	.....	.....
321·65	Foot of Chute des Paresseux	.....	539·1	.....	.....
321·85	Head of " "	33·40	572·5	.....	.....
322.20	Foot of Little Paresseux Rapids	.....	572·5	.....	.....
322·35	Head of " " "	8·10	580·6	.....	.....
323·38	Foot of Lake Pimisi (Eel Lake)	12·70	593·3	.....	.....
324·53	Foot of Talon Chute	.....	593·3	.....	.....
324·71	Head of " "	42·30	635·6	.....	.....
325·18	Rapid below Lake Talon	.....	635·6	.....	.....
325·33	Foot of Lake Talon	·90	636·5	641·6	5·10
332·34	Head of " "	.....	636·5	.....	.....
336.08	Foot of Turtle Lake	29·55	666·05	667·85	1·80
339·36	Foot of Trout Lake	·90	666·95	.....	.....
347·79	Head of " " (summit level)	.....	666·95	669·75	2·80
	Proposed summit level of canal to be obtained by lowering Trout and Turtle Lakes and raising Lake Nipissing 659·1 ft.				
351·98	Lake Nipissing, east shore	Fall. 24·75	642·2	.....	.....
382·42	Head of Chaudière Portage	.....	642·2	649·5	7·30
382.72	Foot of " "	25·60	616·6	.....	.....
384·03	Foot of Chaudière Rapids	·70	615·9	619·6	3.70
391·60	Head of Rapide du Pin	.....	615·9	619·2	3.30
391·69	Foot of " "	2·60	613·3	.....	.....
392·45	Head of Grande Faucille Rapid	·10	613·2	616·6	3.40
392·53	Foot of " " "	5·70	607·5	.....	.....
393·22	Head of Rapide du Buisson	·40	607·1	.....	.....
393·32	Foot of " "	3·30	603·8	.....	.....

Miles from Montreal.	Mattawa and French Rivers.	Rise—Low Water Section.	Elevation above Mean Tide at Quebec, Low Water.	Elevation above Mean Tide at Quebec, High Water.	Difference between High and Low Water.
393·78	Head of Petite Faucille Rapid	.....	603·8	.....	.....
394·00	Foot of " " "	4·40	599·4	605·8	6·40
395·49	Head of Rapide du Parisien	·80	598·6	.....	.....
395·70	Foot of " "	1·20	597·4	601·2	3·80
412·72	Head of Grand Récollet Rapids	·30	597·1	.....	.....
412·74	Foot of " " "	6·90	590·2	.....	.....
413·74	Head of small rapid	·10	590·1	.....	.....
413·82	Foot of " "	·70	589·4	.....	.....
417·54	Head of small rapid	.....	589·4	.....	.....
417·64	Foot of " "	2·00	587·4	591·3	3·90
427·81	Head of Petites Dalles Rapid	.....	587·4	.....	.....
428·02	Foot of " " "	6·10	581·3	.....	.....
430·76	Mouth of French River	.....	581·3	.....	.....

MAP
Shewing the route of the
PROPOSED OTTAWA SHIP CANAL
From
MONTREAL TO GEORGIAN BAY
To illustrate paper by
Dr. R. W. ELLS, AND A. E. BARLOW, M.A.
Proposed Ottawa Ship Canal :-
Scale of Statute Miles.
LEGEND.
Silurian.
Cambro-Silurian.
Cambrian.
Huronian.
Archæan (not divided)
Granite.
Anorthosite.
L. SUPERIOR
Sault Ste. Marie
North Channel
MANITOULIN ISLAND
Nipissing
French River
Georgian Bay
LAKE HURON
Collingwood
Sciern R.
Simcoe
TRENT RIVER
Toronto
LAKE ONTARIO
Hamilton
St. Catharines
Niagara Falls
Buffalo
WELLAND CANAL
Sarnia
St. Clair
Detroit
Windsor
LAKE ERIE
Pembroke
Renfrew
Ottawa
Montreal
Lake of Thousand Is.
Kingston
Belleville
Trenton
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VIII.—*The Psychic Development of Young Animals and its Physical Correlation.*

By WESLEY MILLS, M.A., M.D., F.R.S.C.

Professor of Physiology in McGill University, Montreal.

(Read May 16, 1895.)

II.—THE CAT.

The present paper is a continuation of that series on the psychic development of animals, or psychogenesis, the first part of which appeared in the Transactions of the Royal Society for 1894.

As the desirability, purpose and scope of such investigations have been set forth in the paper on the dog, just referred to, no lengthened introduction will be necessary in the present instance.

The records were made under more favourable circumstances, and are more extensive and complete than those concerning any other animal that I have up to the present been able to study.

The kitten seems to me to have been one of more than ordinary interest, and though the observations extend over 135 days, had the animal not disappeared, I should have continued my records.

The diary will tell to each reader its own story, and I shall, therefore, make the observations upon it somewhat brief and suggestive, rather than attempt to exhaust the lessons it teaches, and as this paper will be followed by one in which the dog and the cat will be compared, there is additional reason for making the notes upon the records, and the part of the paper devoted to conclusions from the observations briefer than they might otherwise be.

The readers who peruse the first of the series, and the subsequent papers, will naturally derive more profit—whatever that may be—from the present paper.

DIARY.

The following notes were made on a litter of kittens, the parents of which were ordinary domestic cats.

They were born July 29th, 1894, and came first under my personal observation two days later.

2nd day. Eyes and ears closed. No evidence of hearing on sounding a shrill dog whistle, etc.

Rubbed hands well on a St. Bernard and a beagle dog and placed them near the nose of one of the kittens. It *sniffed* and became *uneasy* but did not hiss.

The beagle was induced to lie down and the kitten placed against its belly (male dog). The kitten *turned* away.

With a view to testing *taste*, salt, sugar and aloes in solution as well as cow's milk are used. Kitten sucks a feather dipped in solution of sugar but manifests no sign of disgust when aloes is substituted. There is uncertainty as to salt and milk.

As to *smell*, aloes and iodoform brought near the nose cause the kitten to open the mouth and show signs of *disgust*. Blistering fluid (liquor epispasticus) and strong carbolic acid produce the same effects in a minor degree.

When milk is presented no attempt is made to lap it.

When I try to introduce milk into the mouth with my finger the kitten uses its fore-paws to remove finger.

At present the animal may be said to *crawl* rather than walk. It shows great *uneasiness* when it gets near the edge of a table and *holds* on vigorously with its claws, manifesting uneasiness by cries. Removal from its ordinary environment of comfort also results in crying.

When the end of a glass pestle heated to a degree uncomfortable to the human skin is placed against the sole of the kitten's foot *withdrawal* follows.

Gentle *touching* of the mouth or nose, especially the inner surface of the nostrils leads to a decided retraction of the head.

It seems to require a good sharp pinch to cause withdrawal of a part in a way to indicate pain, and the latent period is notably long.

6th day.—Evidence that iodoform is perceived at $\frac{1}{2}$ inch, blistering fluid at $\frac{1}{2}$ inch, carbolic acid at 1 inch and aloes at 2 inches.

The kitten manifests a desire to escape from salt and aloes but not from sugar.

Moves better; makes an attempt to crawl out of a small basket which is lying tilted half over.

The same sort of a pinch as before causes more decided movement with a shorter *latent* period.

The kitten shows no less uneasiness but rather more when brought near the edge of the table.

At a distance of 4 inches from the beagle dog the kitten *opens* its *mouth* and spits. When the *hands* are rubbed on the beagle and brought near the nose of the kitten the same thing happens but the hands must be brought within 1 inch of the nose; and the animal seems to mind it less and less though this is not so manifest when brought near the dog. It still turns away from the belly of the dog when laid against it.

8th day.—Eyes begin *to open* in two of the three kittens.

When I make a loud hissing noise the kitten with the open eyes opens its mouth and hisses, and, when the loudness of the noise is suddenly increased, its jaws snap together audibly.

The use of the dog whistle is followed by uneasy but not sudden movements of all three kittens. No sudden movements of the ears in reaction to sound at present, though they evidently *hear*.

9th day.—The eyes of one of the kittens still not open.

Two of the kittens tested seem to smell equally well: iodoform at $\frac{3}{4}$ inch, carbolic acid at 1 inch, blistering fluid at $1\frac{1}{2}$ inch. *Dislike* manifested by turning the head away and putting up the paw to nose as if to push away something. The mouth is also opened.

Kitten *licks* with evident pleasure at some candy. It licks at salt also, but soon shows disgust. Aloes gave a doubtful reaction.

When the foot is pinched the kitten now *cries* out sharply.

There is a noticeable improvement in locomotor action.

It is impossible for me to convince myself that any of the kittens see. There is a strong tendency to keep the *eyes closed* a good part of the time. The *winking reflex* is not produced by moving objects before the eyes, but follows only when the hairs of the lids are reached or the lids themselves, or some other part of the face or the head is touched.

On the other hand, both a sharp sound from the whistle and a loud sound imitative of a bark, causes the kittens to start, but a *hissing* sound affects them most, and at a distance of 3 to 4 feet, will cause them to open the mouth and hiss.

The *ears* now move reflexly to sound, but turn towards the point from which sound comes, or, at all events, towards the side rather than straight back, as in dogs, or as in rabbits, etc.

Quivering of the ears is noticed, but the cause is not obvious. They turn to the quarter from which sound comes.

10th day.—No clear evidence of power to distinguish objects by the eyes as yet. The ears are noticed to move without any apparent stimulus. The quivering still continues. With each mew the kitten shuts its eyes.

A sharp *whistle* causes the animal to *start*, but the ears move but little. The kittens crawl rather than walk yet, though the pace is increased. There is some amount of *tail* movement.

11th day.—Two of the kittens give evidence of seeing, though one rather better than the other. The eyes are now well open. Seem to *see* at 10 to 12 inches distance, though the evidence of this is not conclusive. *Winking reflex* on movement of the fingers before the eye at $\frac{1}{2}$ inch or a little more.

They can now cry with a relatively loud *voice*.

On testing taste with aloes *disgust* is very plainly shown.

Ears seem to be moved *voluntarily*. The quivering continues.

12th day.—When cooked beefsteak is held within one inch of the nose it is *smelled*, as evidenced by sniffing, etc.

When held near the nose of another it hisses. Neither shows any

desire to secure the morsel. When placed in the mouth of one of them it is allowed to drop out.

The *pupil* is now observed to act, and there is intolerance of strong light. The eyes, however, are not quite free from irritation.

Very sensitive to *touching* by hand anywhere about the head. This was noticed in attempting to cut, ever so gently, hairs on the head with a scissors.

Kitten *turns* to right or left as sound comes from one side or the other. Sometimes *hisses*.

Still walks badly with *hind* legs.

13th day.—From this date only *one* kitten observed.

Is disturbed by iodoform at two inches from nose. The impression seems to be somewhat lasting. When aloes is within $\frac{3}{4}$ inch of the nose the kitten *hisses*.

Pupils vary readily with the amount of light.

Winking reflex as before.

It appears as if it moves its *own head* in response to movements of the head or body of an observer at 2 to 3 feet, but there is some doubt about this.

When lifted from its basket and placed on a table the creature manifests uneasiness and cries as has been the case from the first.

Now walks a little better.

14th day.—When a small piece of cooked liver is held near the nose it *licks* its lips. When the liver or milk is put against the tongue there is no evidence of taste.

Now follows the *finger*, at 10 to 12 inches.

15th day.—A small dog goes up to the basket in which a kitten is lying. It *hisses* owing to smelling the dog (not seeing). When out of the basket does the same at 4 to 6 inches.

Walks in about a three-quarters erect position.

16th day.—Is seen for the first time to *lick* its paw.

The kitten and its mother brought into house and placed in a box about 16 inches long, 12 broad and 9 high, made comfortable by a flannel covering on the bottom. This box was placed within a few feet of where I usually sit in my study so that observations were easily and frequently made.

Kitten uses fore-paws when sucking to press on mammary glands of mother. It often sleeps apart from the old cat now. Its growth begins to be rapid.

Is seen to use right hind leg to *scratch* ear and head on several occasions, and before stopping makes similar movements without touching body.

On holding a small object within 9 inches or less in the box it *hisses* feebly. Is seen to be biting gently at the lower woollen covering in the

bottom of the box. This is the first indication of *play* or something closely akin to it that has been noticed.

17th day.—Kitten follows with its eyes a small object at two feet distant and later my copy of a journal (11 x 8½ inches) at 4 feet. Is able to *locate* whether a light "hist" is uttered on the right or left.

Licks its paws occasionally.

Sleeps a great deal.

18th day.—Seems to be *following* with its eyes the movements of a fly at 4 to 6 inches.

Turns to bite at objects and puts paws together—a sort of feeble attempt at play.

Climbs up side of box to the top and then cries as though desiring to get out.

On calling "puss"! "puss"! softly at about 3 feet the kitten turns toward the sound and moves the ear nearest to it.

A piece of cooked meat is held near but no special effect is noticed.

At 5.15 p.m., the kitten is seen to be plainly following *flies* with the eyes at 18 inches, and slightly raises *paw* in an attempt to catch them.

Licks its own paw and then licks mother's leg which is close to it.

In the *evening* it gets lively and makes attempts at play, and crawls over the mother biting at her and itself [play].

The nose is now getting pigmented.

19th day.—At 11 p.m. to-day, follows finger by lamplight at 4 to 5 feet, climbs upon mother and sleeps there.

20th day.—When "puss"! "puss"! is called to-day the kitten *hisses* softly (surprise).

There is now nearly always a distinct movement of the ear towards the direction of sounds.

Is taken from the box to-day and when free *walks towards* it.

21st day.—Grows well, still *sleeps* much and is very quiet.

After being out of box a short time it *returns* to it and tries to *climb* in. Makes two such attempts and almost succeeded.

Can now follow a finger at 6 feet.

Licks its right hind leg and holds it in a position convenient for the purpose.

Some *incisor* teeth have appeared both above and below.

22nd day.—Distinguishes a finger at 6 feet.

When I scraped the fingers against the box in which it lies, *hisses* (surprise).

Licks herself on neck and chest, a difficult muscular feat.

Biting skin like mother.

Now walks relatively well.

On two occasions to-day climbs to top of box from the outside, does not go in but puts paws on inside.

Does not now return to box so soon when allowed out. It walks around, *smells* at spots in the carpet, but wishes to get into the box in about two minutes; and manages to *scramble* in with difficulty.

It is noticed that the paws spread greatly in walking, so that it may be said to be plantigrade at this period.

Between 6 and 7 p.m., for the last three days, the kitten plays a *little*, lying on its back and using mouth and paws.

A small dog is brought near where it stands on the floor. It puts up its *back* and *tail*, *hisses*—even *spits*—with the fur erected.

Can now follow with the eyes the journal before mentioned at a distance of 8 feet.

Its hearing is also plainly more acute.

Several times to-day it has stretched up in box and looked around as far as possible. When allowed out it goes around investigating with nose and eyes, but still soon wants to get back. After failing once or twice, manages to scramble in, but without hurting itself.

Later the same day succeeds on the first attempt.

The method of descent involves not only considerable control of muscular movements, but some knowledge acquired by experience.

24th day.—Mother away. Kitten cries, as if wanting to get out of box. Is lifted out, and after walking around a good deal, climbs back in the same manner as before, but with much less trouble. Finding the mother there, it begins to play with her. Its attitudes, etc., much more distinctly cat-like than before.

Takes notice of *shadows* in box and elsewhere at night.

25th day.—Takes no notice of milk placed in saucer before it, though held close to the nose; but when put on its lips is removed with the tongue.

A string dangled before it produces no effect.

Is noticed to *watch* its mother's actions more intently, as well as what in general may be going on around it.

When asleep I call fairly loudly, at a distance of three feet, "puss," "puss," but with negative result.

At 11 p.m. desires to get out of box. *Hesitates* when on the edge, and finally *glides* down near the leg of a table, within a few inches of the box.

On stroking its head it *presses up* against the hand like an old cat.

26th day.—Is playing in box early this forenoon. Now and then walks with *tail up*. Cannot always walk without some unsteadiness.

Notices spots on carpet; sinks *claws* into it.

Seeks a *corner*, cries, evacuates fæces, which the mother at once removed, as when her progeny kept closely to the box.

Later it leaves the box again, and is taken back by the mother, which carried the kitten by the loose skin of the neck.

Soon it leaves the box again and goes to a part of the room where there are some book shelves, the lower ones of which are not completely filled with books, but hold other things.

The mother follows it. The kitten is put back into its box.

First noticed to-day what seemed to be purely *voluntary* movements of the ears.

Continues to notice *shadows*, and to-night tries to put its paw on them.

Still takes no notice of meat.

Licks hind foot, and while doing so spreads its *toes* apart as an old cat may be seen to do under similar circumstances.

27th day.—On getting out of box starts on a little *run* for the book shelves.

It was taken from among the objects on the shelf, turned towards the box and given a few taps. It ran on to the box and got into it.

The mother is in the box moving her tail to and fro. The kitten plays with it.

I suddenly appear near the box with a coat on—light in colour, with pronounced vertical stripes—when the kitten at once *opens* its mouth and on my going nearer, *hisses.*

Later is seen watching flies, at a distance of 6 to 7 feet, flying.

Now gives evidence of hearing slight sounds at some distance in the room, and apparently notices the notes of a piano downstairs.

The movements of the ears are more pronounced.

The kitten continues to show a strong desire to get to the book shelves, about which the mother manifests some anxiety, which she evinces by staying close to her.

Mother is making her toilet—the kitten bites at her in *opposition.* The mother then seized her by the neck, and after holding her quiet for a few seconds, goes on with her operations ; but puts one leg over her as if to be on guard against any further interference.

28th day.—Feeding again attempted. A small quantity of milk is given in a little saucer, which the kitten licks, but seems to get some of the milk into the nose, which causes *sneezing.*

Plays with a small piece of coal found in her box.

On suddenly throwing aside a curtain that covers the book shelves, the kitten is found there and *hisses.*

I place her in a rocking chair over 18 inches from the floor, but she manages to *scramble* down without injury to herself.

About 5 p.m. the entrance to the book shelf was barred up. The kitten first tries every part of the barricade, then pushes in the curtain —cries with vexation—climbs upon a box near—leaps from this on the curtain, holding on with the claws. After trying again and again desists, and after a few moments returns to the attack. At last she gives up, returns to her box, settles down and sucks her mother, and then soon

after falls asleep. Her attempts to get into this shelf and accomplish her object were to me a study of unusual interest, especially as the animal was only 28 days old.

The eyes are now capable of much quicker movements than before.

Now hears "puss" however lightly uttered, also hears dogs barking in the yard.

This has been a day of activity and notably great advancement.

29th day.—Quieter to-day (reaction ?)

Without its mother last night for the first time.

Takes a little milk twice to-day.

There is some difficulty in keeping the milk out of the nose which is owing to inability to *hold* the head just right. When solid food as *meat* is put in the mouth it is rejected.

Shows a desire to use *claws*, sticks them into objects.

In play have seen an incipient run on two or three occasions.

When the mother has been cleaning the kitten after answering nature's calls there have for some days been cries but to-day there is active protest with teeth and claws, which however the mother heeds but little.

When placed on a window ledge 2 feet from the floor (and seeming more) the kitten looks down and plainly would like to get down but does not venture to try the descent.

After lapping milk to-day it cleans itself (toilet).

Is seen for the first time to *wash* its own face.

30th day.—To-day a *pan* containing some fine sand in the bottom is set near the kitten's box which is to be used as a retiring place to encourage cleanly habits. The sand will be frequently renewed.

The studies in connection with this have proved very interesting and instructive to the writer.

The kitten climbs out of box and goes to the *corner* of the room near the box and cries. It is then lifted into the pan and soon passes urine.

It then visits the book-shelf and tries to get in ; *cries.* Not succeeding it returns towards its box and having to pass the pan on the way it puts one paw into the sand but withdraws it and goes on.

It soon enters its box and sleeps.

Later is out of its box.

The tearing of the paper wrappers from a journal startles it considerably.

In the *evening* leaves its box and plays a good deal. It can now walk well and run in some fashion.

It carries *tail* in all ways now and moves it more or less.

It makes many attempts to get into the book-shelf and at last succeeds.

For its play even the leg of the table suffices. It *darts back* as if it was afraid of it, etc.

31st day.—Is out of its box—*cries*—is put into pan—after some delay urinates.

Plays with carpet, a piece of coal, the edge of box, etc., its *back* being arched, *tail* up, etc.

Notice movements of tongue, jaws, etc., when asleep as if sucking or lapping milk.

This morning the kitten *stretches* like an old cat four or five times when it gets out of its box (first time seen).

A string curled up at end is dangled before it in the box. The kitten *starts* back and *hisses.*

In the evening it is found behind the barricade of the book-shelf sleeping on some books. It is taken out but works its way back again. It finds getting out difficult but perseveres.

To-day *plays* with a ball and a spool.

This evening laps milk *without* any trouble, for the first time.

32nd day.—Kitten seems uneasy; is placed in the sand pan; after *crying* and *pawing* it passes urine. Then slips out and stretches itself.

Still some trouble with nose when lapping milk.

Enters the pan of its own accord. No results.

It tries the book-shelf barricade, but not succeeding gives up and sits in its box near by and grooms itself well.

Later it makes a more *determined attempt* on the barricade and with success. It has difficulty in getting out; but soon goes in again and remains from $\frac{1}{2}$ to $\frac{3}{4}$ of an hour.

Enters pan; cries; urinates; much licking of the paws after it leaves the pan.

On moving one of my fingers before it the kitten boxes with it.

Physical. Its *eyes* are changing colour, being a sort of blue-gray. *Paws* no longer splayed. Its *fur* is darker in colour. It is rather a light tabby. *Fore-legs* not quite straight. *Tail* carried vertically a great deal. To-day spends much time sleeping behind the barricade. When taken out it goes back persistently.

Still sucks the mother, using the fore-paws vigorously in *pressing* on the mammary glands.

It may be said to *jump* out of the box now rather than scramble out, *i. e.*, lands on floor with a sort of leap; though it still scrambles in much as before.

33rd day.—Found behind the barricade this morning before daylight. when trying to prevent its advance in a certain direction the kitten evades me by running under a rocking chair where it is partly hidden.

See it trying to *catch* a fly in the pan to-day.

When put in the pan now it nearly always *paws* the sand whether there is anything further or not.

Mother and kitten play together to-day for the first time.

Though the book-shelves were closed by a curtain tacked on them the kitten managed to get in, though I do not know how.

Now *goes towards* persons sitting or walking in the room, and wanders about more or less.

Is startled by water running from a sink with down suction to-day, though about 30 feet distant.

34th day.—In a sort of *perverse play* bothers its mother so much that she puts her fore-legs about the kitten to hold it quiet. Then the latter scratches so vigorously with hind legs that the mother cries out.

To-day the kitten is kept in the pan nothwithstanding restlessness and crying till it *passes fæces* for the first time here. This followed by much grooming of itself as in an old cat.

The kitten has now a look of much greater *intelligence.*

35th day.—Growing well. Weighs 1¼ lbs. Is given milk, then placed in pan and uses it.

To-day when called "puss!" "puss!" as it lies behind the barricade it comes out.

Now manifests pleasure in being stroked.

Its vision is now so keen it can rapidly follow movements of the fingers, etc.

It scrambles into the book-shelf by a new way and at a much greater height.

Is seen to *catch* at its own tail for the first time.

Two skye terrier puppies are brought near the kitten. It makes a great fuss showing all the signs of *anger*, etc.

Some cooked *fish* (of which cats are notoriously fond) was placed before the kitten. It licked this but did not eat any though there seemed to be a certain amount of surprise and excitement.

36th day.—The day is dull, and the kitten lies in its box a great deal in the forenoon, though later it rouses itself and plays with its mother.

I try for some reason to intercept the kitten when it *makes a long run* to escape.

To-day for the first time it *crosses the threshold* of the room door, but was scared back.

For the first time too it sinks it claws into *an upright object* as an old cat often does.

Some raw meat is placed before its nose. It *sniffs* at this but makes no attempt to eat it.

It begins to understand better the meaning of the call "puss!" "puss!"

Its manner of play now much more active and complicated.

Is noticed *stalking* on two occasions to-day—once towards the mother's moving tail.

37th day.—This morning early, the kitten enters the pan of its *own accord* and functions.

When I cough at 6 ft., the kitten puts up its back (surprise).

It is given milk on the window ledge referred to before; and when it has finished lapping *scrambles down* between the wall and a rocking chair.

Later it comes over to me and *climbs up my clothing* into my lap.

Visits the pan again of its own accord and functions; after which it retires to its box and sleeps.

Climbs into a waste paper *basket* and after moving about among the papers a little while, climbs out without upsetting the basket.

The kitten walks out of the room but on being turned back towards the door and the hands clapped it runs in again.

Again uses pan of its own accord.

Walks out of the room and begins to *climb the stairs* leading to a higher flat.

Climbs into my wife's lap in the evening and from thence *gets upon a table* beside which she is sitting, and plays with objects on the table.

At the sound of footsteps in the room, inclined to retreat from the table.

38th day.—Slept long behind the barricade this morning. On awakening goes spontaneously to the pan.

To-day goes behind books on another shelf near my table, and when removed, returns.

Cooked meat is *licked* but not chewed or swallowed.

Goes from my daughter's lap to the table top and sleeps there. On awakening it looks down after moving about some, crouches but hesitates to go further.

About 9 p.m., on this day when sitting on one of my legs, the other being separated from this only about the length of the kitten, wishing to get across to the other leg, it fears to leap, but walks up higher where there it finds a natural bridge.

The kitten is put on the window ledge where there is some milk. It soon wishes to get down; hesitates, cries, looks to mother apparently for aid, walks along the whole ledge, in doing which as the window is open it must pass over a surface only $1\frac{1}{2}$ inches wide. At last I hold a journal a little way from the ledge upon which the kitten steps and is lowered by me to the floor.

Sucks mother now practically only at night, though up to the present it has eaten no solid food.

39th day.—When lapping milk the old difficulty is noticed to-day and occasionally still.

Climbs on my lap and thence upon the table by which I sit, making use of the table cloth as a means of ascent.

Gets from an ordinary chair to the table, and comes upon my lap by a little leap—the distance being about 7 inches—first crying, however, as if aware of the danger and difficulty.

If at any time it is out of the room a little way, and hears footsteps, etc., it *runs* back.

Now goes from table to any chair that may be near it, and *thence to the floor* by a sort of scrambling descent.

On dangling a string before it, the kitten at first *hisses*, and then in a moment *plays* with it, catching it with her paws again and again.

Goes to pan spontaneously. Always cries before answering nature's calls, and paws the sand invariably afterwards, and sometimes before.

40th day.—Weight 1½ lbs. Growing well.

Tries to get on a low chair about a foot from the floor, on which there is a stool that almost covers the top. In this it fails. The kitten then goes to the book shelf near, and tries to reach the chair. The stretch is too long, and the result is the first and only *fall* I have ever seen her sustain.

When sitting on my knee its mother calls for her. The kitten crouches as if *to hide.* Saw something akin to this lately, when she was sitting in a big chair, and the mother was seeking her.

Runs into the hall, thence to the bedroom, and when scared out *does not* at once return to the study.

To-day *jumps* from the table to the chair, 16 inches below the table, and about 12 inches out from it.

Climbs up the cane back of a rocking-chair, and returns by the same method easily.

Hearing seems to have reached its maximum acuteness, as a very slight sound arouses her, even when drowsing.

41st day.—On entering the room this morning the kitten walks towards me. As I stand it mounts on hind legs and puts its fore paws against my leg.

Is on the table when I am writing, and manifests much interest in the movement of my pen.

After using the pan to-day, covers up the *actual spot* wet for the first time, though always paws somewhere.

When I enter the room in the afternoon, the kitten gets down from a rocking-chair and comes to meet me.

When sitting on my knee, three feet from the table, it manifests a desire to get on the table by looking towards it and crying.

42nd day.—Has been out in a dark corner of the hall leading to the study, and in a bedroom also not far off.

Climbs up my leg and thence to table three times in succession, though put down each time.

Sits on the table watching the movements of my pen, or playing with various objects it finds about.

Again visits the waste paper basket and plays with some crumpled papers in the bottom.

Smells keenly at my fingers that had handled a *recently killed mouse*.

When the mouse is presented to it, the kitten smells it, licks it, and then bites it. When I attempt to draw the mouse away the kitten holds on with its teeth and claws, and growls slightly.

Jumps down from a height of 1½ feet to-day without any fall.

43rd day.—Kitten sleeps much to-day. When awake wishes to be either in my wife's lap or on the table.

Offer it some meat. Smells and licks it, but makes no attempt to eat it. Licks its lips long after the meat is put to its mouth, as if to get rid of the last trace of the meat. When it is brought near it again makes off.

Is very playful this evening. Interferes so much with the pen as one writes it is impossible to do so while it is near.

44th day.—Plays vigorously, but not long, at one time. Sleeps a great deal.

In the evening finds a new hiding place and fails to make any sign when called.

Is put in pan, but will not remain in. Micturates *in a corner* and is given a mild punishment, which is well borne.

In the evening visits the pan, and after using it, takes great pains to paw up the sand into a heap.

Catches flies. Plays with one of them after it is dead.

Runs into the *most distant room* on the flat on which the study is, *i.e.*, it goes further from home, so to speak, than ever before.

45th day.—Races about much to-day, under chairs, out of the room, etc.

Of its own accord visits the pan and defæcates twice, taking pains to cover up what is passed.

46th day.—Eats for the first time to-day small piece of cooked meat and potato; licks the plate on which it is, and seems to like the food very much.

Acts with a dead mouse as before.

Plays with its mother so violently that the latter seizes it and holds it down.

47th day.—A piece of catnip that affects mature cats so peculiarly, produces no such effects on the kitten, which seems rather to dislike the smell.

48th day.—Full of an apparently reckless activity. Climbs up and down chairs, etc., with great vim and rapidity, but never falls. When tired sleeps, and sleeps long.

Meat is offered to-day. Smells at it but does not eat till a small piece is placed in its mouth, when it *eats* with apparent relish all placed before it.

When on the table a spool falls to the floor. In an instant the kitten leaps from the table to my wife's lap, and thence to the floor. In its play runs behind the book shelf and rushes out at its mother from behind the curtain again and again.

49th day.—Catches flies on the window—takes no notice of dead flies.

When engaged in this sport it upsets a vessel containing a little milk, and is so startled by this that it rushes down at once with a peculiar expression on its face.

50th day.—When we are at dinner to-day, the kitten runs into the dining-room on the flat below its home.

Since this long wandering from home it is difficult to keep it in the study, as it wishes to be here, there and everywhere, maintaining ceaseless activity when not asleep.

Jumps from the table to the floor by one *clear leap.*

51st day.—The kitten climbs from my chair up my back, and rests on my shoulder.

As its mother walks up-stairs, the kitten crouches back from the top as if to spring on her by surprise.

52nd day.—Again climbs up my back and remains there while I walk downstairs.

On coming home late I go into the dining-room, into which the kitten also shortly walks.

53rd day.—I can notice a change in the shape of the kitten's head. It is more elongated, etc.

Its eyes are also changing colour—getting lighter.

54th day.—Is very playful all day.

At night, late, when I go into the dining-room, the kitten follows, and when there climbs half way up a wire-netting door separating the kitchen from the dining-room.

On stroking the kitten to-day it is noticed to *purr* for the first time.

55th day.—On stroking the kitten it purrs. Soon after it sits on the table and purrs of its own accord still louder.

56th day.—Manifests an unusual desire to sit in my lap and on the cushion of the chair between my legs.

57th day.—The kitten *eyes* very closely, from the top of a rocking chair, a canary *bird* in a cage at a height of two to three feet, and at about four feet distant.

It also *crouches* when it sees flies moving on the floor, etc.

A small dachshund dog is brought into the study to-day. The kitten puts up its back, growls, etc. The little dog and the kitten are then taken on my wife's lap. The kitten holds off, but looks interested, and finally approaches and smells at the dog.

Spontaneous purring occurs this evening.

The kitten "washes its face," at first one paw then the other, in an elaborate way not seen before.

58th day.—It is beginning to be difficult to keep the kitten out of the dining-room, and to-day it tries hard to get in by the wire-gauze door.

59th day.—The kitten seems to be *uneasy* when quite *alone.*

Came *up-stairs* to-day to use the pan.

There is a fire in the grate in the study for the first time this autumn. The kitten touches the poker, which is hot. It hisses, etc., but soon after it touches it again and again, in its usual persistent way.

60th day.—After tea I lie down on a sofa in a room adjoining the dining-room, whereupon the kitten climbs upon the sofa and walks from my legs up to my chest, where it remains purring.

Now generally comes when called "puss," "puss."

Present physical condition :

Colour not very greatly changed. Is still a light tabby.

The shape of the *head* is now much more like its mother's.

The *eyes* seem to be getting lighter.

Weight, 2¼ lbs.

Height, 7 inches.

During the past two weeks it shows much waywardness. When an attempt is made to thwart the kitten in any way, it bites, scratches, etc., in a half earnest, half playful way.

63rd day.—Slips by some mishap in part into a water pitcher, which is followed by hissing and a great fuss generally.

65th day.—For the first time is allowed outside on the front steps. No longer remains as much in the study.

67th day.—Kitten to-day micturates in the *corner* of the study, notwithstanding that it had been solicited to use the pan. Is punished with a small strap.

70th day.—For the past two days the kitten is much inclined to *repeat* the offence of the 67th day.

Very active and very *mischievous.*

Seems to take a delight in interfering with one's reading, writing or whatever I may be engaged in.

Late in the evening I call "puss," puss," but no puss comes. After looking here and there it is discovered beneath the table, beside the waste-paper basket, trying to *hide* from me. When I go to one side of the basket the kitten betakes itself to the other.

77th day.—Is plainly growing fast, especially in height.

The kitten up to the present has been out of doors in all about half a dozen times. On one occasion cried to get out.

The kitten still cries when it feels any want or when it cannot accomplish its object, or is disappointed, *e. g.*, it will *cry* if it goes to the window and cannot find flies to catch.

A skye terrier is brought into the study, also the dachshund that was in before. Seems more inclined to attack the skye than the other dog.

Is more especially fond of sitting in my wife's lap and begins to show *attachment* to her above all the other members of the family.

Now likes to lie before the fire. This especially shown yesterday, a wet and cold day.

Now shows fondness for *fish*.

Now often when put in the pan will scrape up the sand, yet keep looking about awaiting a chance to escape.

The kitten now takes its sleep mostly at night. It has a much more intelligent, older, more matured look than a couple of weeks ago.

81st day.—When calling for it at night in the dining-room it again plays at hide and seek.

84th day.—Physical growth evident. The kitten's *eyes* are now the colour of its mother's.

Shows increased fondness for sitting in my wife's lap, near the fire, etc.

Less trouble for some days in getting the kitten to use the pan.

The dachshund puppy is brought into the study. The kitten manifests less excitement; evidently *remembers* him.

The kitten can now and for at least three weeks past watch a *long series* of events *intently*.

87th day.—In carriage of body, tail, etc., very like a mature cat.

88th day.—The kitten is offered some bread and milk, which it sniffs at but evidently does not want. After thus smelling at the food it *scratches around* it as if to cover it up.

91st day.—Now when allowed out the front door the kitten runs across the road to a vacant lot opposite, without special fear. When let in follows one up close as I notice a mature cat often does.

The way in which the kitten makes a choice as to a difficult leap to-day after much evident observation, apparently careful weighing of difficulties, etc., before the decision and choice between several possible ways are finally made, is a fruitful study.

The same judgment is shown in its behaviour towards a *parrot* kept in the same room. The parrot has always proved more than equal to any of the kitten's advances, and this the latter seems fully to realize.

98th day.—Growth in height noticeable, though I see the kitten daily so much.

The canary's cage is set in a new position near the parrot. The kitten makes a spring on the cage and falls back. It is punished for this and takes it well.

Later it moves up towards the parrot but the latter is ready to nip its paw, etc., so the kitten withdraws, showing some dread of this quiet but watchful creature.

The kitten still shows the mischievous tendency. It likes to knock down spools from the table and especially to take pins out of the cushion.

Will sometimes *cry* for my wife to sit down so that it may lie in her lap.

101st day.—Was outside this morning when my dogs were being taken out for exercise. Is taken by surprise and rapidly climbs a tree just at hand to the height of 30 feet. Does not seem to know how to descend, or fears to do so. A long pole is hoisted up to it, and after being pushed a little with the pole it takes the hint and gets on the pole and so is lowered down.

105th day.—The most marked feature in the kitten's conduct for a week past has been its sociability or its pleasure in being near those human beings with which it has been most associated. Seems to look now to my wife as its best friend.

When lying on the floor near a rocking chair, in motion, the kitten puts its paw *near* but not under the rocker.

The canary cage is again near the parrot's, and the kitten seems to find it difficult to refrain from leaping at the canary.

Is now very fond of getting out of doors and roaming about.

Last night as soon as the lights were put out the kitten cries as if wanting to get out of the study; wishing to go downstairs; does so, and at once goes to the front door.

Was taken up again struggling vigorously. When placed in the pan it at once makes use of it.

The kitten seems now to show a great increase in her liking for us all.

To-day by a series of climbings gets to my shoulders, then puts up its paws on my head and purs in a most decided way, suggestive of *pleasure* and *affection*.

107th day.—Is trying to get into a flower-pot with earth in it, apparently with the object of using it as the pan; and about two weeks ago was observed to *scratch* at sand in a vessel set near the fire to dry.

110th day.—Kitten sits in bedroom window looking out and evidently enjoying the sunshine and view.

112th day.—Was again found up in a tree very near the house, though the cause is unknown.

The dachshund was in the study to-day. The kitten evidently *remembered* the dog, and they at length put nose to nose.

When the kitten looks down on the dogs from the upper verandah, it shows some fear, begotten of its tree experience I think, rather than from instinct alone.

Later the kitten gets sufficiently familiar with the dachshund to be inclined to play with its tail, and take other liberties.

After being fed of late the kitten quiets down, seems pleased, perhaps grateful, purrs, etc.

118th day.—In order to test its behaviour a *living mouse* tied by the tail or hind leg, is confined in a paste-board box. The kitten smells at the box eagerly and follows up the box as it is carried away. When the mouse is released the kitten seizes it with a growl. It does not at once kill the creature but plays with it. When I go near the mouse it is seized with accompanying growling. After thus playing with the mouse for from 15 to 20 minutes the kitten eats it completely.

119th day.—The dachshund is brought into the study to-day. Is less afraid and inclines to be more aggressive with the kitten.

The kitten is inclined to play with the dog, but very little seems to bring forth a hiss.

After the kitten has been out in the cold (latter part of November), it expressed great pleasure on its return to comfort as manifested by purring, rubbing itself against one's legs, etc.

When any of the family goes down-stairs late in the evening the kitten will also go (food).

127th day.—The dachshund brought into the study to-day. Both lie on my wife's lap. By degrees the kitten takes more and more liberties, such as biting its ears and neck playfully.

Both go down to the dining room when dinner is ready. A plate with meat and potatoes on it is set down before them. The kitten snatches a piece of meat but does not venture to take any more food from the plate.

Later a skye terrier is brought in but the kitten does not make free with it.

Now follows my wife about much like a dog going after her even out of doors.

When standing near the table the kitten jumps from it upon her shoulder.

129th day.—Flies are now very rare and whenever the kitten sees one it makes for it.

Sits in the window watching snowflakes fall and tries to catch them through the window panes.

To-day a member of the family the kitten seldom sees goes into the cellar to get some meat for the cat and as he walks down the steps he calls "puss!" "puss!" The kitten seems puzzled and runs about looking up at my wife in the kitchen and crying, and this is repeated and every time with the same result. My wife goes to the cellar door, induces the kitten to go down a step or two, when the kitten observing the one who is calling it near the meat runs down.

135th day.—The kitten is out early in the evening in front of the house and is after a while sought for but cannot be found, having in all probability been picked up by some one passing.

Remarks on the Diary.

Since I propose to make a comparison between the development of the dog and the cat in another paper by which more instructive results may it is hoped be reached, the remarks that follow are to be considered rather in the light of suggestions as to some of the ways in which the diary may be utilized than as a commentary at all complete.

It will be seen from the records that the evidence for taste and smell before the 3rd day is not very convincing; that the evidence for a temperature sense, the feeling of pain, ordinary reflex action from tactile sensibility, etc., is more conclusive.

By the 6th day a great *advance* is recorded in regard to all these qualities.

Fatigue is still readily experienced.

Sometimes as *e. g.*, on the 9th day an apparently decided advance is shown in a single day.

The experience of fear or surprise seems to be experienced first about the 9th day though the sense of hearing, if we except that uneasiness and crying that results almost from the first when the animal is removed from its usual surroundings.

The spontaneous movements of the ears and more doubtful movement of the tail on the 10th day are worthy of note.

Attention is called to the advances in vision as noted on the 11th, 13th, 14th, 18th, 22nd, 25th, 26th, etc., days.

On the 8th day the eyes began to open, but hearing was then established.

On the 11th day winking is caused reflexly by the movement of an object before the eyes at the distance of $\frac{1}{2}$ inch.

On the 13th day the pupils respond to light.

On the 14th day a small object is followed by the eyes.

The 16th day was memorable as on that day was noticed the first licking of the paw, the first act of scratching and the first play,

On the 18th day the nose, uncoloured at birth, began to pigment.

The 21st day furnishes evidences of recognition by the kitten of its box as its home, for after being out it returns to it and climbs in.

Attention is directed to the various stages of development of muscular co-ordination, as illustrated by the kitten's toilet-making, play, getting in and out of its box, and from one object to another in the room, and which can be followed from the somewhat full records of facts bearing on this subject. The records of certain days are clear on this point, *e.g.*, 16th, 18th, 21st, 23rd, 28th, 29th, 30th, 32nd, 33rd, 37th, 51st.

The behaviour of the kitten towards the same dog at different times, and as compared with the second dog, seems to me to indicate an interesting struggle between instinct and other qualities, and shows how the re-

sult, in any one case, depends on past experience, the stage of development, and much more that each reader will put into the case, according to his own views of physiology and psychology.

Similar remarks may be made as regards the behaviour of the kitten towards the sand-pan. This little history illustrates, it seems to me, some of the fundamental laws of all training and education, whether applied to the human being or the lower animals.

The case is simpler as regards the latter, but not wholly different, and observations of the kind made in this case impress me more than ever with the importance of attempting to give the fullest possible record of every feature in the psychic development and the physical development of those animals by which we are surrounded.

The history of the kitten's whole bearing towards the book-shelves has been to me a most instructive one. I have never witnessed such perseverance in the accomplishment of an object in any young animal—not excepting the child. It seemed that the greater the obstacles the greater the efforts the kitten put forth to overcome them—behaviour that we usually consider especially human, and ever an evidence of unusual strength of character.

That this kitten was not an ordinary one in many respects I am quite prepared to believe, but still the animal was a cat, and a cat only, and that such "character" should have been shown was a surprise to one who has been a long and close observer of animals.

I have seen something akin to this in that remarkable bird the parrot, but not in a parrot so young as this kitten.

One of the remarkable features in the whole group of the *felidæ* was illustrated in this kitten, viz., the slowness with which they learn to eat and drink, and the length of time before difficulties are fully overcome.

A comparison of the kitten's behaviour towards the parrot and the canary furnishes food for reflection, and in this, as in all such cases, all narrow explanations prove inadequate; and while the laws of association, etc., may explain much, they do not seem to me to explain all in the case of the lower animals, any more than in the case of the child or the man.

Conclusions.

While there can be no doubt that cats are born deaf and blind, the question of smell and taste is more difficult to settle. Up to the third day, and even then, there is no clear evidence of smell and taste, though, on the whole, it would appear that the facts in favour of the existence of smell are more certain than in the case of taste.

There is evidence on the third day of reflex action, brought about through stimulation of the skin; of the existence of the ability to distinguish hot and cold objects, and of capacity to suffer pain; though, as

regards all these, the latent period is relatively very long. At birth, and up to the third day, though it is likely that all these powers exist in the animal, the evidence is feeble.

Motor power is restricted to such an extent that the animal can crawl only and but slowly.

Tactile sensibility, the sense of pain, and the temperature sense, reach their highest degree of development earlier than hearing and vision.

Hearing is established before seeing, and reaches its greatest perfection sooner than vision.

In the progress of all the senses to full development, the course, while marked by definite steps, is often so rapid that distinct advances may sometimes be noted in a single day.

Not only in the development of the senses, but in all other phases of progress has this been clearly evident in the case of the kitten under observation.

Apart from the senses, etc., there seems to be a definite order in which all the features of feline nature appear, *e. g.*, purring, crouching, stalking, etc.

Certain physical changes are correlated in time with certain psychic developments, the significance of which is in some cases clear, in others obscure.

IX.—*The Psychic development of Young Animals and its Physical Correlation.*

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(Read May 16, 1895.)

III.

THE MONGREL DOG.

The Mongrel and the Pure-Bred Dog Compared.

In my first paper on the psychic development, etc., of the Dog (Trans. Roy. Soc. Can., 1894), the observations and conclusions applied to pure-bred animals only, though two widely different breeds were compared.

It seemed to me desirable for many reasons that the mongrel should also be studied, accordingly this paper will be devoted to that purpose and to a comparison between the mongrel and the pure-bred dog in a manner to harmonize with my general plan of treatment of the subject of psychogenesis in the lower animals.

DIARY.

The puppies under observation belonged to a litter of 9, of which 7 were preserved. The dam was a strong, healthy black animal and the sire was unknown. The dam and puppies were kept under similar conditions to those described in my first paper on the dog, *i. e.*, in a pen on the floor of a separate compartment of the kennel on which at first there was abundance of good straw and at a later date sawdust. The puppies were born in December and artificial heat was maintained in the kennel constantly so that the animals were always comfortable. The dam was well fed and otherwise properly cared for throughout, and from beginning to end was perfectly well and able to nurse her puppies in an entirely satisfactory manner.

1st day.—Vigour of puppies shown by a strong *voice* somewhat between a growl and a bark.

They respond to a *prick* or punch and to a *hot* body but not so quickly. Oil of wormseed placed near the nose causes a sniffing; pure carbolic acid causes the face to be distorted; blistering fluid leads to protrusion of the tongue, and tincture of iodine to sniffing.

When soup is similarly placed before the nose there is *no* evidence of *smell.*

Solutions of salt and of sugar, also cow's milk are presented at different times. Certain conclusions cannot be drawn. The brush on which the solution of sugar is presented is sucked vigorously however.

The puppies will *not crawl off* a table, etc.

2nd day.—The irritating substances used on the first day produce more marked effects.

No positive evidence is forthcoming as regards milk, but sugar seems to be agreeable.

When salt is put in the mouth it is rejected doubtfully, but aloes most *decidedly.* Both are used in solution.

5th day.—Irritants affect the puppies through the nose at a greater distance.

It remains doubtful whether *meat* is smelled or not, but milk and a solution of aloes seem to be, for the puppies cease to make their characteristic sounds when these substances are placed before the nose.

They do not yet seem to show any shortening of the latent period of reflex action on pinching.

9th day.—None of them show any signs of opening of the eyes.

10th day.—When blistering fluid in a bottle is brought near, active movements result; the head is lifted up, the tongue put out and sneezing, etc., follows.

Now when a solution of salt of the same strength as that used before, is presented it is *rejected* and there is frothing at the mouth, etc. Much disgust is also shown towards aloes; with milk the result is not pronounced, but with sugar there is undoubted enjoyment.

Eyes begin to open.

19th day.—On clapping my hands and uttering "hist" vigorously the *ears* are moved indicating the ability to hear.

20th day.—Evidence of hearing as above at the distance of four feet.

A piece of meat put within a half-inch of the nose of one of the puppies causes it to move towards the object and lick the lips. The same follows when cheese is used. When the same experiments are tried with sleeping puppies they also lick the lips.

Stamping with moderate force on the floor of the kennel (concussion) within two feet of the puppies rouses them far more effectively than a sound of considerable loudness.

One of the puppies is brought into my study. It moves about—crawling rather than walking, with its *tail* carried or held much as in a turtle—the *hind-legs* being much spread out.

No great uneasiness manifested.

The puppy is a picture of healthy vegetative existence.

The *incisor teeth* are appearing.

As an evidence that the puppy is influenced by the change in the *environment*, it may be mentioned that the cheese and the meat do not produce now the effects they did when the puppy was in its own pen.

Under favourable conditions a mere trace of salt causes decided signs of disgust.

When blistering fluid is held within 2 to 3 inches of the nose the puppy acts as if something unpleasant were in its mouth.

The puppy winks occasionally, apparently spontaneously; but *winking* cannot be induced *reflexly* until the moving finger is approached so close to the eye as to almost touch the eye lashes.

When the finger and thumb are moved as in snapping the fingers but without causing any noise, the puppy under observation *turns* its *eyes* in the direction of the object, so that I have no doubt that a small object as a finger is distinguished at 3 to 4 inches and a larger one at about 2 feet. When the fingers are snapped in the ordinary way the head as well as the eyes are turned towards the exciting object, showing that vision and hearing are both stimulated effectively and together.

Motor activity is still poorly developed.

The coat—straight before, begins to show waviness.

24th day.—To-day a puppy follows a fish-bone by smell and attempts to bite at it.

25th day.—The appearance of the eyes show an advance over a few days ago.

When the dam is brought within 6 to 8 feet of the puppies they seem to become aware of her presence by *smell first* of all, but when within a few feet of them they follow her with the eyes.

There is a decided improvement in locomotion.

The puppies now have all the upper incisors, the canines above and below, and two molars above and two below.

Hearing is now very acute. A very feeble "hist," when within a couple of feet causes movement of the ears, turning of the head and an expression of the face that indicates clearly that the puppy hears.

A "hist" of moderate intensity is heard readily at five feet.

There is a tendency now when any object is placed before the puppies to *growl or bark* at it in a meaningless way.

31st day.—To-day a slight sound caused a starting. The puppy (henceforth the only one) seems to have reached that period when hearing as a mere sensation is perfect, but the interpretation of sounds very imperfect, hence he is startled by many sounds that later produce no such effect. When a bone is placed within 4 inches of him, he sniffs at it and gets up to secure it.

He makes the first attempts at *gnawing* a bone, using his paws to steady himself and once lifts a paw as if to place it on the bone but does not actually do so.

The puppy now evidently sees small objects at some distance quite well.

He now stands quite erect on his legs and to-day climbs over the rungs of a small rocking chair.

When in the house to-day he manifests *shyness* or appreciation of the strangeness of his surroundings.

When his head is *stroked* he acts somewhat as a cat.

Has begun a sort of *playing* with his dam.

The *social* tendency is clearly evidenced.

38th day.—Has grown much. There is a great change in his attitude, manner of walking, etc. The puppy can now *run* fairly well.

He has wonderful control of his *tail*, moving it when he approaches, vigorously as an old dog.

For a week past his *social* tendencies towards human beings have been very marked.

He is now provided with practically his full complement of *teeth*.

His *eyes* and general *facial expression* have also greatly changed.

He is still readily startled by sounds.

He as yet reposes a good deal, which perhaps accounts in no small degree for his perfect health and excellent state of nutrition.

He now sees small objects at a distance of 8 to 10 feet at least.

He is ready to *eat* almost anything given him.

He can now *bite* accurately at any part of his body.

39th day.—His *weaning* is begun regularly to-day.

42nd day.—The following experiments were tried to-day: When a finger was put in his mouth he sucked it, but he would take no notice of a stick presented in the same way. Bread he tackled at once using his back teeth to crush it. Meat he devoured eagerly. He had received no nourishment of any kind for one hour previous to these experiments.

45th day.—Puppy is brought into my study. Shows little or no shyness after a few moments. He is inclined to move about and use his nose in an *investigating* way.

He can now run fast and well, his power over his *hind legs* being good.

He hears perfectly even faint sounds.

On being held before a piano when it is played upon, he manifests no special effect.

46th day.—The puppy gets up to a water pan over a foot high and resting his front paws on it laps water, the whole proceeding reminding one of a mature dog. This was first done, however, three or four days ago.

A small Skye terrier and afterwards a Collie are allowed to enter the puppy's compartment but he does not seem inclined to notice them much.

Lies with his head on the sill of the door of his compartment.

47th day.—After I play a little while with the puppy and then retire he barks impatiently to get out.

49th day.—The puppy is playing in the yard. Scratches at the snow like an old dog. After defæcation he draws himself along in the snow.

He pulls at the withered branch of a vine growing against a fence.

He ascends a snowbank in the yard wagging his tail.

He seems very much at home with the older dogs and adapts well to his surroundings.

52nd day.—The last remark applies with much greater force now.

He is very free in all his movements. Carries his *tail* up and wags it vigorously.

Considerable change is observable in the shape of his *muzzle* within a few days.

On being given a *bone* he does not commence on it at once but carries it to his bed instead of gnawing it on the sawdust that covers the floor of his pen.

53rd day.—To-day the puppy is trying hard to get out of his compartment, pushing his head through between the iron-wire door and the sill and using *his paws* to enlarge the opening—in fact he behaves in this very much like a mature dog.

56th day.—When he is out of his compartment (the door open) and he is told to go in, and one stamps with the foot he retreats to his box but soon wants to come out again.

63rd day.—He now mingles with all the dogs of the kennel, large and small, seems to enjoy the life and manages to adapt admirably to his entire environment.

69th day.—Prior to defæcation moves about, smells, turns round and round, etc., just like an old dog.

Shows sexual feeling if one may judge by his actions towards a mature bitch.

87th day.—Since the last record his progress in adaptation and in general development has been steady. As the chief stages in development had been now overtaken he was removed to my laboratory for experiment on the brain.

Remarks on the Diary.

Observations on the temperature sense, tactile sensibility, and the sense of pain were not made as early as desirable in the pure-bred puppies, but this omission was made good in the present case, as the diary shows, and there can be no doubt that these senses all exist from the moment of birth. The evidence that true *smell* as distinguished from the mere sense of irritation of the nose by pungent vapours is less conclusive, while that for taste is more doubtful still.

The increasing development of tactile sensibility, and especially the readiness of the nervous system to respond to stimuli acting on the nasal

mucous membrane, is well illustrated by the observations recorded at different times in the early life period of the puppies.

Both smell and taste are very feebly developed before the eyes are open, but about the 10th day there was clear evidence of both enjoyment and disgust through taste at all events.

The general advancement of the animal is well shown in its behaviour towards blistering fluid on the 10th day.

By the 20th day smell had become a powerful moving force in the animal as it always will continue to be.

The manner in which a sleeping dog, young or old, is affected by the presence of food with a pronounced smell is very impressive to one who witnesses it.

At so early a period as the 24th day this puppy's sense of smell was so well developed, it will be noticed that he followed a bone by its aid quite well. At this period he used his eyes as well as his nose to guide him.

At this date also hearing was good; in fact by the 25th day the dog had reached a period of fair development of all his senses and with considerable motor power which of course also implies a corresponding development of the muscular sense. Hearing seems to be the most rapidly developed of all the senses *i.e.* the period from its first beginnings to its greatest acuteness is relatively short.

The pleasure of the puppy on having its head stroked on the 31st day is noteworthy.

The Mongrel Dog and the Pure-Bred Dog Compared.

In my first paper on the Dog (Trans. Roy. Soc. Can., 1894) certain differences were noted between two varieties of pure-bred dogs—the one large and the other small, viz., between the St. Bernard and the Bedlington terrier. I now propose to compare the pure-bred and the mongrel chiefly on the basis of my records in the earlier and in this paper.

The mongrel showed more vigour at birth and shortly after as evidenced to me at a distance by the voice. He also seemed to be somewhat less influenced by cold, though more persistent or at least more successful in getting all the heat possible from the dam.

Although this is not specially noted in the diary the mongrel did not show fatigue quite as soon as the pure-bred dog.

The eyes began to open earlier than in either the St. Bernard or the Bedlington. I could not get certain evidence of smell in the case of the St. Bernard before about the 12th or 13th day, but in the mongrel there is some evidence of smell on the 10th day at latest. The Bedlington smelled meat on the 10th day. I am not prepared to state that dogs do not smell at all before the 10th day or even the 5th day for which there

was some evidence—or even on the first day—but I am of opinion that before at least a few days after birth smell is so feebly developed if at all that one could not *demonstrate* its existence to an unbiassed observer. I refer now not to the effect of irritating volatile liquids but to the ability to smell food.

The mongrel showed signs of disgust with aloes and a positive liking for sugar as early as the 2nd day. I could not establish this for the pure-bred dogs for some days later.

It is noteworthy that on the 3rd day the mongrel sucks one's finger more readily than a piece of meat.

Though dogs are carnivorous animals before a certain period in their development they are no more excited by meat than any object whatever, showing in the clearest way that there is an order in psychic as in physical development.

Owing to absence from home when the mongrels were passing from the 11th to 18th day I am unable to make any accurate comparison in this case as to the beginnings of vision and hearing.

In both the mongrel and the pure-bred dogs the winking reflex is very slowly developed and long remains feeble *i.e.*, is excited with difficulty.

Certain considerations must be borne in mind in attempting to compare the mongrel puppy and the St. Bernards. The latter I consider an unusually active litter, while the mongrel for a considerable period seemed to me more than usually vegetative. Moreover, while there were always at least four St. Bernards together, this mongrel was the only one of this litter after about the 20th day.

One of the features of development greatly impressed on my mind by these comparisons, not to mention many other similar ones, was the influence of one on another in all the lines of development. This was shown both negatively and positively in the case of the mongrel. After he began to mingle with the older dogs his progress was marvellous. He seemed in a few days to overtake himself so to speak and his advancement was literally by leaps and bounds. It is very difficult to give an adequate idea of this feature of the mongrel's history in a diary, but I wish to note it specially because it seems to me to show that while education in the wider signification of that word may in a sense account for development, it is equally true that the real nature of any animal will in the main assert itself sooner or later however unfavourable the early environment. In other words heredity is, was and ever will be stronger than environment.

One may safely say that in all kinds of dogs the perception of light and shadows precedes the seeing of objects and that the latter is comparatively slowly developed.

The mongrel seems to have been very slow in developing the play instinct which I attribute largely to his being the sole puppy from an early period and therefore seeing no other dog but his dam.

In both the mongrel and the pure-bred puppies hearing progresses rapidly to perfection of sensation. Within about 10 days the maximum of acuteness is reached and the puppies are then very readily startled by noises, *i.e.*, they are reflexly greatly affected through the ear—much more so than through the eye. This fact has been very strongly impressed on my own mind again and again.

As regards voluntary movements, there were differences to be noted. The mongrel seemed the sooner to gain control over the hind limbs. The same may be said of tail movements. Though one could not trace so general a development in the mongrel as in the St. Bernards by a certain period, the former had the greater power over his tail both as regards variety and vigour of movement, especially the latter.

There was a comparatively sudden development in this mongrel which I can scarcely think is common, but in regard to this point I must speak cautiously till further exact observations are made, as I do not wish to make statements of mere general impressions with no definite basis of observation.

The movement of the ears especially, though others also fall into this class, following on noises are purely reflex and constitute one of the most delicate and early evidences of hearing. But as in the case of the pure-bred puppies concussions are earlier and more readily effective than sounds.

While both the pure-bred dogs and the mongrel recognize a change in surroundings and are affected by it, herein lies one of the great differences between them alike in puppyhood and in after life.

One may compare the man "well born" and surrounded by conditions that tend to form the gentleman in the completest sense of the term with the pure-bred dog, just as the mongrel represents the peasant whose ancestors and whose surroundings alike are against the highest attainments.

The mongrel lacks all that refinement, modesty perhaps I may say, at all events that delicate appreciation of his own place and that of his fellow dogs and human beings which constitute such conspicuous features in the psychic whole of the pure-bred dogs. The latter show towards each other in a kennel with many together when their owner encourages and gives a chance for their exercise, kindness, justice and many qualities utterly foreign to the nature of the majority of mongrels. I do not now use the term mongrel in the sense of a cross between two pure-bred dogs, but in the more popular acceptation of a dog bred from parents that were mongrels and perhaps the remoter ancestors quite unknown.

It is interesting to inquire whether these features of the psychic organization are shown in the young puppy and if so, when.

Almost from the first the mongrel puppy shows an ability to scramble for himself in "this rough world" not manifested by the pure-

bred dog His very voice on the first day of his existence may, and in this case did suggest this, but in nothing was it shown so much as in the successful manner in which he held his own among the dogs of the kennel, large and small. This was all shown before the puppy was two months old. His confidence in himself, his power to adapt to unfavourable surroundings, was as advanced at this age as the St. Bernards at four months. He reminded me of a forward boy, lacking in all true modesty and due appreciation of what was due his seniors. Yet this mongrel by virtue of this very psychic condition succeeds in his purposes if one may so express it.

In the litter of St. Bernards, the most prominent and precocious one could not compare with this mongrel. In the lower animals development is so rapid that new features in the psychic character at times seem to reach a comparatively complete development rather suddenly even when the animal is watched daily. This was especially observable in the mongrel puppy after a certain date and was I think all the more so because his development for a time seemed rather slow, which I attribute in part to his being the sole puppy for most of his life.

And here I would draw special attention to facts of this character. The puppy's weaning was not begun till the 39th day as his dam was well able to supply him with milk and his nutrition was excellent; but when this process, generally requiring a good deal of care and often attended by much derangement of health, was began there seemed to be no need of gradation, etc. The puppy was ready at once in every sense to eat all kinds of food fit for a dog.

When he was allowed out in the yard all voluntary movements seemed to undergo a rapid development which was not largely due I think to special exercise or practice, but to the sudden development of elements of the nerve centres that had been functionally latent.

As before stated this case of rapid development in different directions has impressed me very forcibly and seems to be in harmony with a law of nature of pretty wide application.

I do not think this puppy's intelligence was equal to that of the St. Bernards at three months, though superficial observation might have led one to conclude the reverse. Forward people often pass with the undiscerning for having an ability they do not possess, because of their confident, showy bearing, and the same remark would apply to this mongrel puppy. The animal is now more than four months old and I have seen nothing in him to lead me to alter this opinion though much to confirm what I have endeavoured to make clear as having impressed me as true of the psychic nature of mongrels as compared with pure-bred dogs.

The characteristic physical features of the adult certainly appear in mongrels sooner than in all the larger breeds of dogs, in other words they mature sooner than these breeds both physically and psychically, though

not in all cases more rapidly than the smaller breeds of terriers. While all pure-bred dogs must have a definite rate of development according to the breed, it must be plain that mongrels will vary much more individually according to the nature of the ancestors which have contributed to their highly composite origin in many instances. In the very nature of the case the pure-bred dog is an inbred animal, while the mongrel is generally the very reverse. He in fact approaches far more closely to the wild *Canidæ* in this respect.

From this it would be expected that the physical changes would be of a kind that would appeal to the eye much less—would be in fact less readily referred to any type or pattern; and in no small degree is this true of his psychic characteristics, though these things are much more readily observed than made clear by any records.

X.—*The Psychic Development of Young Animals and its Physical Correlation.*

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(Read May 16, 1895.)

IV.

THE DOG AND THE CAT COMPARED.

Although, in popular estimation, the dog and the cat are considered as opposites in almost every respect, in reality they have much more in common than any two of those animals commonly kept by man—as should be expected from their place in nature.

A comparison will, however, prove profitable, it is believed, and this will be based chiefly on the diaries of the papers on "The Dog" and "The Cat"[1] respectively.

Both the dog and the cat, it is scarcely necessary to point out, are born blind and deaf, but the eyes of the cat open sooner than those of the dog, and hearing is also acquired somewhat earlier; but in both the processes of learning to see and to hear are gradual ones.

The pupillary reflex is established sooner in the cat.

So early as the 9th day, the kitten studied and previously reported on,[2] turned its ears towards the direction of a sound.

There is this difference, too, in the movement of the ears: the kitten, when re-acting to a sound, turns the ears or ear reflexly to the side rather, while the dog tends to draw them back.

I have observed nothing in the young dog that corresponds to the quivering movements of the ears in the kitten, seen as early as the 9th day, and which possibly are imperfectly executed voluntary movements, like the trembling of the hand in old people.

There is nothing in the dog that corresponds exactly to the hiss, or when feebler, the opening of the mouth in the kitten when surprised. So far as I know, this is *sui generis* among our domestic mammals, though there are analogies perhaps in birds, as in the hissing of geese or ducks, and the snapping of the beak in pigeons, even when very young, to which abundant reference has been made in my corresponding paper on birds.[3]

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[1] Trans. Roy. Soc. Can., 1894, Sec. IV., p. 31; 1895, Sec. IV., p. 191.

[2] Trans. Roy. Soc., 1895, Sec. IV., p. 191.

[3] Trans. Roy. Soc., 1895, Sec. IV., p. 241.

So early as the 3rd day the young cat gives evidence of the possession of genuine smell, as shown in its behaviour towards a dog placed near it. At the same time, the sense of smell is very feeble. Upon the whole, it would seem that taste and smell are both present rather sooner in the cat than in the dog, and in both the beginning is feeble, but they go on to fairly rapid development. However, I have not changed my opinion as expressed in my first paper on the dog,[1] that the dog, and I will now add the cat, find the nipple of the mother by touch rather than by smell, and that they are drawn towards the belly of the mother by the warmth of the part.

In both the dog and the cat there is a long latent period in the case of reflex movements from a pinch, etc., as compared with such an animal as the rabbit, though there can be no doubt that the tactile sensibility, the capability of feeling pain, and the temperature sense, as well as feeble motor power hardly worthy the designation (voluntary), exist in the dog and the cat at birth.

I am not prepared either to affirm or deny that taste and smell are present at birth, but if they do exist, I am quite sure they are of the feeblest, of very little use to the animal, and play but a very subordinate part in its life during the blind period.

The kitten is at first, if not always, more sensitive to a touch, has finer tactile sensibility about the mouth than the puppy.

There are the same individual differences as to the exact date of the opening of the eyes, the eruption of the teeth, etc., in the kitten as in the puppy.

The dog and the cat resemble each other in the slowness with which they acquire power over the hind limbs.

Neither the puppy nor the kitten have any appreciable voluntary control over the tail during the blind period; but the dog finally uses the tail much more than the cat in the expression of his emotions. What the dog does with his tail the cat often expresses by purring, which, as I have shown in the paper on the cat,[2] is developed somewhat late—much later than the friendly wagging of the tail in the dog; and as will be seen by a comparison of the notes (diaries) on the dog and on the cat, while there are definite stages in tail carriage for each, these are different altogether for the two animals, and herein we notice a far greater difference than in locomotor activity. The tail movements and carriage are definitely related to the character of the animals, and to those that watch them closely, express distinct and varying phases of emotion, etc.

The antipathy of the cat to the dog, while related to a psychic state based on self-preservation from intruders, is peculiarly marked towards the dog, though whether more so than towards any other similar animal,

[1] Trans. Roy. Soc. Can., 1894, Sec. IV., p. 31.
[2] Trans. Roy. Soc. Can., 1895, Sec. IV., p. 191.

or towards, say a large part of the animals that might be found in any menagerie, is one that I have not investigated. I have been very much impressed by the fact, that at an early age the kitten, when suddenly disturbed in any way, reacts much as if a dog had come upon it, though in a less marked manner.

Nevertheless, the behaviour of a kitten, even a few days after its birth, towards even the smell of a dog on the hands, is very suggestive of an instinctive fear or dislike of the dog. At the same time, I have seen a kitten act much the same when an irritant was placed near its nose, or after it could hear, when it was startled by a noise. This subject is worthy of further study.

Equally striking in the kitten as in the puppy is the rapidity with which the creature tires under any sort of stimulus, especially within the first twenty days of life. After a few trials, sometimes after the very first one, the smell of a dog ceases to produce the reaction in the cat during the blind period, and unless one is aware of this all sorts of erroneous conclusions may be drawn regarding very young animals. This tendency to rapid fatigue indicates in reality, both why the animals do sleep and must sleep so often. I am quite satisfied that any sort of irritation, whether from within or from without, that will prevent frequent periods of sleep occurring, will disorder the health and even cause death in young animals, and I believe this is one reason why parasites are so injurious to very young animals.

As in the case of the dog, a young kitten, even on the day of its birth, will be slow to crawl off a surface—as a table. These animals have what amounts to a sense of support, the absence of which causes them uneasy sensations. They turn away from the space beyond their support because it does not afford the essential sensation, and as I have remarked in my first paper on the dog, this seems to me as fundamental as anything that is to be found in animal psychology.

In the cat as in the dog, the winking reflex is slowly developed, and is never so marked as in man. A cat can look at one much more steadily than a dog and for a longer time, a fact which has its own psychical significance.

The cat knows no shyness or modesty in the sense in which a dog, especially a pure bred dog, experiences such a feeling.

In one particular the cat is greatly in advance of the dog at the corresponding period, and also finally, viz., in co-ordination of voluntary movements.

Though according to my notes the kitten did not begin to use the limbs in scratching (quite a complicated movement for a young animal), much before the puppy, if at all, still progress, even in this direction, was much more rapid in the cat. I have taken care to give a very complete account of the movements (actions) of the kitten so that there might be

available a full history of the development of these movements in an animal, in which they finally reach extraordinary perfection.

There is no comparison between a puppy's range of co-ordinated movements at three months and those of a kitten of the same age.

That in the course of evolution the possession of sharp nails has had much to do with this, I feel satisfied.

In both dog and cat the cortical centre of the brain for the fore-limb is readily excited by artificial stimulation, but this crude method and general result, do not bring out the differences that the animal can, by its own will accomplish, and serves, when taken with the facts of the animal's actual life, only to show how very imperfect are our physiological imitations of will-power in these animals.

None of our domestic animals has such power over the fore-limbs as the cat, and this is well established when the animal is even two months old. The development, as my diary shows, is very rapid when once it begins.

And this is closely related to the play of the kitten.

Play is especially instructive. The young animal has an excess of vital energy. Very soon this begins to express itself in imitative actions. I hope my diaries will furnish scope for comparison of the puppy and the kitten as regards play. Herein the animals differ widely and reflect to perfection their psychic moods.

The crouching, lying in wait, the concealment of which I have made several records for the kitten, are only late and comparatively feebly developed in the dog—all of which is, of course, related to the manner in which the mature animal secures its prey in the wild state.

The *Canidæ* hunt either alone or in packs, and rely on swiftness and concerted action.

The *Felidæ* lie in wait, mostly alone or in pairs, and spring on their prey. So the kitten, when quite young, does not wait for a mouse to appear, but gives its instinct free scope in its attacks on flies, and if these be not forthcoming, it will, out of something, construct imaginary prey for its gratification.

Again, the cat is very slow to develop, as my diary shows, the social instincts so far as man and other animals are concerned. How seldom a cat seems even to miss its old friends, if indeed they are to it friends. Not that I believe the cat an entirely ungrateful animal. It is very sensitive to good and to bad treatment, but it is not dependent on man either physically or psychically. The cat may, of its own accord, take to the fields and woods to secure an independent existence, and so long as the environment is favourable, it may, it would seem, be utterly oblivious alike of friends and foes.

This independence was shown quite early in the case of my kitten. At the same time one of the most interesting features in this psychic

study has been noting the way in which higher mental states and better qualities prevailed in the end in this kitten under good treatment. It had finally become social and affectionate, discriminating in favour of the one who had really done the most for its comfort. But of self-denying, purely unselfish devotion to a master, as in the case of the dog, there seems to be little—very little in the cat. But puss is no flatterer, and her readiness to resent ill-treatment may have had much to do with her not occupying a higher position in man's esteem.

I have myself raised a cat from the depths of degradation, so to speak, to self-respect and the respect of others by patient and persevering good treatment, and I am anxious to record the fact, as I believe the cat to be much misunderstood and its intelligence greatly under-rated.

If the term intelligence be employed in a wide sense and be made to cover the power an animal has to adapt means to ends in a more or less conscious way, including the adaption of its own organization to the environment, then the diary of the cat will furnish an interesting record bearing on this subject. In fact, from this point of view, the cat during the first three months of its life is decidedly in advance of the dog.

In the mature cat instinct in securing prey plays so prominent a part that we are apt to overlook a great deal in the mental experience of the cat. Her psychic life is withdrawn from us to a greater extent than that of most of our domestic animals. I do not know of a single good history of the complete development of the cat from birth to maturity, so that I regret the more the loss of my kitten before she had reached the age of at least one year.

The diary also shows that the cat has a good memory, though whether equal to or better than that of the dog I am not prepared to say—the evidence is insufficient for the purpose.

On the question of will-power, there is, however, ample evidence for making comparisons.

If the quivering movements of the ears were imperfect voluntary movements these may be considered about the first manifestation of will in the kitten, and there is nothing to correspond to this in the dog at so early a state.

While attempts to get from the original nest or home took place at an early period in both the dog and the cat, they were more persistent in the latter.

I have given in considerable detail the history of the kitten's attempts to get into my book shelves, etc., and I must repeat that this furnishes to me the most impressive evidence of the existence of a strong will-power intelligently expressed that has ever come under my observation in so young an animal of any kind. While I think that the kitten whose history I have recorded was above the average in strength of character, if I may so express it, yet in making all allowance for this there is still a

very large margin in favour of the cat. I doubt if the dog does at any period of his life possess this persistence to the same extent as the cat, and as in many human beings, this characteristic is associated with unusual physical stamina. The cat's power to live, in spite of its unfavourable surroundings, and her power to resist disease and recover from injury, are undoubtedly greater than in the dog.

The cat is notoriously an independent creature, and in common estimation devoid, or nearly so, of docility. But this very independence and readiness to resent, tends, as I have before explained, to cause the cat to be misunderstood. I have, with set purpose, given in great detail my kitten's history with reference to education in cleanliness, and growing out of this subject alone a long, and I venture to think, valuable paper might be written on the subject of the education of animals and human beings.

It will be observed that the kitten's instincts were met by placing a sand-pan directly in its path from a box in which it slept to the book-shelves which it was determined to visit.

From the first moment that its foot was placed in the sand I noticed that a powerful appeal had been made to the creature's psychic nature—a new experience engendered a new psychic life—awakened dormant emotions, tendencies, etc., and these were fundamental. To my mind this is at the very root of all sound education.

At times, it is true, a little gentle restraint had to be used to prevent the chain of psychic connections forged by these experiences from being broken. But how different the result in this case from that which followed opposition to the kitten's going among the book-shelves. The latter was an instructive thing, the expression of the feline nature to seek retirement in the day time, and so strong was it and so supported by will-power and intelligence, that this kitten baffled human efforts in this case to go counter to its nature. I have been accustomed to encourage even young puppies, as soon as they are able to leave their nest, to form habits of cleanliness, but I have no notes on this subject at all so complete as in the case of this kitten, though some will be found in my first paper on the dog.

But I now leave the reader with the diary before him to draw his own conclusions.

The cat can be taught much, but her education must be conducted somewhat differently from the dog's, because her nature is not in all respects like his.

The dog, especially the pure-bred dog, is docility itself. The dog may be forced to obey—the cat cannot. The dog usually delights to obey, or at all events to meet the approval of his master, and he only fails to make this evident when carried away by the force of his instincts.

The cat may be coaxed or bribed into docility, but the latter is not a prominent feature in her character.

It is a mistake, however, to suppose that the cat cannot be taught and taught much, and I think the diary of the kitten, to go no further, shows this clearly.

Certain it is, however, that one will learn more of the cat's intelligence by quiet observation than by any attempt to form her nature by education after the manner so successful with the dog.

The tendency of the kitten to arouse in the evening and display an activity greater than during a large part of the day is, to my mind, an early exhibition of a fundamental trait in the psychic life of the *Felidæ*.

They are essentially nocturnal animals, and to witness how early this was shown was interesting.

I have noticed nothing like this in puppies, though it must be remembered that the cat is more like her feral congeners and reverts to a wild state more readily than the dog—in fact, that such reversion is far from uncommon.

In my first paper on the dog I have called attention to suggestive actions. In the true sense of the word the cat is perhaps less imitative than the dog, but so great is her tendency to be excited by any kind of motion, that she can, as is well known, be set into activity with the greatest ease by a ball or almost any moving object when a kitten of a certain age.

In this susceptibility the cat is in advance of the dog. In fact, her motor energy is more intense and her power of correlated movement much greater, but I am inclined to consider that in all this the cat is less imitative than the dog. The behaviour of one kitten has less influence on the others than of one puppy on his fellows.

The individuality of the cat is intense though it is the individuality of a strong nature manifesting itself by independence rather than great difference in conduct.

As an admirable example of associated reflexes to which reference has been made in treating of the dog,[1] the history of the sand-pan furnishes excellent examples.

The whole history of the kitten is an illustration that, however strong instincts may be in an intelligent animal, its psychic life is determined by experience, *i.e.*, there comes to be almost no pure instincts—instincts unmodified by experience, if such a thing is conceivable, as the language of some writers would seem to imply. Each day of this kitten's life showed me a progress dependent on experience, and the same applies to the dog; but I must add that for the first eight or ten weeks the kitten seemed to get the most out of its experience, though in the case of the mongrel,

[1] Trans. Roy, Soc. Can., 1894, Sec. IV., p. 31.

whose nature, as I have pointed out,[1] seemed after a time to develop with great rapidity under the impulse of experience, was a rival in this respect with the cat; but that case is exceptional I must believe.

As regards reasoning, I have in no wise changed the opinions I expressed in my first paper on the dog, and I would apply them with almost if not quite equal force to the cat.

Some General Conclusions.

The conclusions that may be drawn from the diaries of the dog and the cat respectively, with certain modifications in some directions, hold for both.

This applies especially to the larger proportion of what is most fundamental—to what is instinctive and is bound up with the vegetative life of the creature.

Nevertheless, even in some of these fundamentals of psychic life there are differences, *e.g.*, in the mode of waiting for and securing prey, differences which appear long before development is complete.

Upon the whole the cat develops more rapidly than the dog.

The greatest difference between the cat and the dog is in their relations to man and to their own species.

The dog is essentially a social and a gregarious animal; the cat an independent and solitary creature, traits which are early shown.

The dog is docile in the highest degree; the cat to a slight degree, as compared with the intelligence she possesses.

The cat is far in advance of the dog in power to execute highly complex co-ordinated movements.

In both the dog and the cat the play instinct is early and highly developed, but in the manifestation of this the peculiar qualities of each are well exhibited.

In will-power and ability to maintain an independent existence the cat is superior to the dog.

In the higher grades of intelligence the wisest dogs are much in advance of the most knowing cats, which is foreshadowed if not actually exemplified in the early months of existence.

The nature of the dog as compared with the cat tends to beget prejudices in his favour with the mass of persons in any comparisons as to intelligence, desirable qualities, etc., so that there can be little doubt that in general the dog is overestimated and the cat underestimated by the great majority of persons; at the same time the nature of the dog is much nearer that of man's than is the cat's.

The kitten may amuse, but even a puppy dog touches chords of sympathy in the heart of man that the cat can never reach.

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[1] Trans. Roy. Soc. Can., 1895, Sec. IV., p. 213.

XI.—*The Psychic Development of Young Animals and its Physical Correlation.*

By WESLEY MILLS, M.A., M.D., F.R.S.C.

Professor of Physiology in McGill University, Montreal.

(Read May 16, 1895.)

V.

THE RABBIT AND THE CAVY OR GUINEA-PIG.

In pursuance of the plan followed in other papers I shall first give a record of observations on which to base conclusions.

Both common and pure-bred rabbits have been studied, and this rodent will be considered before any comparison is made with the cavy or guinea-pig.

The following notes refer to a litter of common rabbits.

DIARY.

1st day.—The animals are found on the first day to be *blind*, the eyelids not yet having opened, and *deaf*.

They are also *naked* or almost entirely lack hair.

They can move about, but only in a *sprawling*, feeble way.

They lie in a nest lined with the mother's hair, and the slightest movement near causes them great *disturbance*.

A couple are removed from the nest after making observations on them there and taken into the house for closer study.

The slightest touch or even a slight puff of air from the mouth causes them much disturbance—they move in an irregular ill-co-ordinated way, but evidently are greatly affected.

It is especially difficult to get anything near the *mouth* without causing movement, owing, no doubt, in part at least, to the "feelers" in some instances, but not always.

A fly crawling across the head causes jerky movements of the head as a whole, and of the ears.

Irritating liquids, as blistering fluid, iodine, carbolic acid, etc., when held before the nose, cause movements of *face* parts.

Aloes in solution and milk placed before the nose give negative results.

When solutions of Epsom salts, common salt and aloes are placed on the tongue, this organ is protruded in a way suggestive of dislike.

There is in one case even a feeble attempt to *wipe away* the substance with the paws.

A pinch causes violent movements, though there is *no sound* made. In fact, as far as my observations go, young rabbits rarely, if ever, utter any sound.

The *ears* are inclined backward and lie close to the head, as in dogs, cats, etc., at birth.

The animal can manage to *stand* for a moment after a fashion, but the usual mode of progression is by a sort of *crawling*.

From the first the respiratory movements of the nostrils, so characteristic of rabbits, are shown.

They can also *wipe* the face with the fore paws—a very characteristic act of the rabbit, or perhaps one should say of the rodent.

The manner in which they push under one another and *huddle* together, shows how they, like other young animals, are rendered uneasy by cold and quieted by warmth.

They will *not crawl off* a surface, but when they near the edge turn back.

3rd day.—There is a very noticeable increase in size.

Their movements are more pronounced.

The first *scratching* of a surface (in this case my hand as one lies upon it) noticed.

This is a highly characteristic act of mature rabbits.

When they are put back into the straw near the nest proper they push through and get to the other young ones in the nest, evidently attracted by the *warmth*.

Cannot induce them to suck my finger as puppies will do readily, though a little more inclined to suck the lips or the end of the tongue.

4th day.—*Hair* is now growing over the whole surface of the body.

7th day.—Irritating liquids used before now produce more decided results and at a greater distance.

The evidence that milk is *smelled*, though doubtful in one case, seems clear in another.

Testing as regards taste I have found very difficult in the rabbit, as the tendency to withdraw the mouth suddenly is very strong.

There seems to be no doubt, however, that a solution of aloes produced disgust.

There is a great advance in movements. They are very *quick and irregular*, and may be to one side or the other as likely as forward or backward. Reference is especially made now to movements produced reflexly.

When placed on a table the young rabbit moves about in a circle in a half crawling fashion, and feeling the way, as it were, with the head.

It uses the *paws* fairly well to get rid of anything, *e.g.*, a feather put against the mouth.

It is easy enough now to make out the *colour* of the various members of the litter.

The ears are held *back and down* only as yet, still there is an approach to the position of the ears at times of old rabbits.

When irritating substances are put before the nose the ears are moved, probably reflexly.

They are still both blind and deaf.

9th day.—Twitching, as in the case of puppies and kittens, is noticed during sleep.

10th day.—The eyes of some of the litter are now open.

When I produce a short, sharp sound by a dog whistle, taking care that they do not feel the blast of air, they move, turn the head to one side and also move the ears. The effect is less pronounced after two or three trials (exhaustion) though very marked at first.

Can get no clear evidence of vision nor any eye reflexes, such as winking.

There is such a tendency to *jump about* that one almost leaped from my hands, though the source of the stimulus was not obvious.

11th day.—The eyes of some are not yet open.

13th day.—A great advance in growth is to be observed within a very few days.

When one touches the nose or other parts of the head they almost *jump out* of the nest, reminding me of an animal reacting to a stimulus when under the influence of strychnine.

Very decided advance made in the *position* of the ears—they are more upright and are moved more readily.

Can get no evidence of vision.

Can get no reflex from the eyes till the cornea is touched, and not very good then.

About the *hearing* there can be no doubt whatever.

14th day.—The *ear carriage* is still better. *Eye reflexes* feebly present.

They are found out of the nest and go to the mother to suck when distant from her two or three inches.

15th day.—Since they strike against the side of the nest (board) I am satisfied there is no distinct vision.

They are able to reach the mother when three or four inches distant.

They seem to *smell* fresh, green food placed in the larger box with which their nest communicates.

They do not seem to start quite so much when touched as they did.

The rapidity of general *growth*, and especially of the *hair*, is impressive.

There is an obvious advance in smell and taste.

While not certain, I have a suspicion that they begin to distinguish objects. They possibly take notice of shadows.

The first attempt at *eating* made to-day by nibbling at grass put before them.

They now begin to *lope* in the manner peculiar to rabbits.

They also begin to get up on the *hind* legs.

They will by no means creep off any surface on which they are placed.

They now hear a soft whistle at from four to six feet, as is evidenced by starting movements and ear movements (reflex).

The ears, however, do not move backward or forward, but laterally.

These organs are now thinner, held more erect and better unfolded, so to speak.

16th day.—I think they begin to distinguish objects by *sight*, though it is difficult to demonstrate this.

It is impossible to produce the winking reflex till the eyes are actually touched.

17th day.—It is difficult now to say whether they approach objects through sight or smell.

18th day.—When I sneezed close to their box to-day they all huddled together in a *startled* way in a corner of their nest, in a manner very characteristic of older rabbits when alarmed.

By the manner in which they leave and enter their nest I conclude that they retain the *memory* of the relations of objects apart from visual and olfactory sensations.

The mother is now *weaning* her offspring.

One is seen circling around in the box as if attempting to find the mother by feeling, making it doubtful if distinct vision is even yet possible to them.

To-day they eat clover.

20th day.—They not only eat green food, but *gnaw* at a crust of stale bread.

They jump about in the box as if *playing*.

They seem to *follow* by smell a green stalk I hold in my hand.

One is so *startled* by my sneezing that it jumped off the top of a barrel on which I had placed it.

The *ears* are now relatively longer and thinner and are better held.

21st day.—They detect objects (food) by smell at an increased distance.

They are leaping about a good deal, apparently from excess of vitality.

22nd day.—They *follow* my finger as I move it, so that I think there is now no doubt that this is done by sight.

They *eat* stale bread quite well.

24th day.—The young rabbits are removed to a large cage. They now show *fear* when a sudden motion is made, showing that they *see* well

at some little distance at least, and I am under the impression that this was the case two or three days ago.

They now *lope* mostly like older rabbits, *i.e.*, they use the two hind legs together—a sort of leaping.

26th day.—They appear now to see objects at a distance of three or four feet, if not more.

28th day.—They move on the waving of a hat at a distance of eight feet.

29th day.—Being cool to-day they are quieter and huddle together.

30th day.—They seem now to be practically mature from a psychic standpoint.

Diary of Himalayan Rabbits.

I now give some extracts from notes on a litter of pure-bred rabbits, which may, in some directions, supplement the facts recorded above, and in others furnish grounds for comparisons and contrasts.

2nd day.—A breath of air causes *reflex* movements.

One of the litter is seen to use its hind leg to *scratch* itself.

3rd day.—They are seen to use the hind legs to scratch the body and the fore legs to *wipe* the face.

4th day.—Already they show *jerkiness* in movement under the slightest stimulation.

6th day.—Any attempt at voluntary movement, if such it may be called, is very jerky.

When put on a barrel top one of the rabbits turns round, but does not crawl off.

8th day.—Placed one on the barrel top again. When the hand is held near it will move towards it, attracted by the heat probably—possibly by smell.

10th day.—Eyes not yet open.

Green food held within two or three inches is *sniffed* at.

Hair has now grown on the body to the length of a quarter of an inch.

12th day.—*Eyes* of some of the litter now open, but not of all.

The slightest touch with a leaf of green food causes them to *leap* in the nest.

They now move the *ears* and *start* when I produce a moderately loud sound with a dog whistle. The ears are moved to the extent of one-quarter to one-half inch.

14th day.—They now move readily from the nest, which, as in the former case, is situated in one corner and elevated a few inches, to some other part of the box and back.

Suspect feeble vision, but cannot demonstrate it.

They begin to *nibble* green food.

15th day.—Their mode of *progression* is more like that of the mature rabbit, *i.e.*, loping rather than walking, in the ordinary sense of the word.

17th day.—They are seen not only to *lick* and *scratch*, but to *bite*.

18th day.—Begin to poke into *corners* now when placed on the floor.

19th day.—There is no doubt that they now *see*.

20th day.—One now begins to show the *dark markings* on tail, ears and nose, characteristic of the breed.

They now *scratch* hard at the wood of their box at times.

21st day.—They *eat* oats.

25th day.—A fair pad of hair has developed on the foot.

They are now put down with the members of the other litter, twenty-two days older, and act very much as they do.

28th day.—Their hair has grown about as long as that of their parents.

The Cavy or Guinea-pig.

The following notes were made on a litter of common cavies and will serve to mark the contrast between this rodent and the rabbit in the rate of development, etc.

Diary.

The cavies were born between 2 p.m. and 5.30 p.m. in July, and were tested at 9 a.m.—say after about seventeen hours.

Not only are the eyes *open* but they *see* well, and when the finger is moved before the eyes the *winking reflex* follows.

Some of them are placed on my study table and *run* so fast they almost get off the table before being caught.

The *ears* are well *opened up;* and when I whistle moderately they again run almost off the table.

I find it more difficult to demonstrate whether they smell or not than in the case of the rabbit.

When volatile, pungent liquids like blistering fluids, are placed near, the eyes seem to close; and the same happens with aloes.

Like rabbits they are born with teeth (in front) and this makes it not very easy to get things into the mouth to test taste.

I am quite unable to decide whether they taste or not.

They are tested again at 11 a.m. the same day.

Pungent, volatile liquids, such as used with the rabbit, and aloes do not seem to affect them so much as the rabbits, *e.g.*, no sneezing is produced.

When a feather, dipped in a solution of sugar, is placed in the mouth it is *sucked*, but they turn away from similar treatment with aloes.

A couple of them are put into a box 18x8 inches in which there is some salt, some brown sugar, some "peppermint rock" candy and some camphor.

They *licked* at the salt once but did not repeat this, but went again and again to the sugar or remained by it. They did not remain near the other substances. They were not kept long in this box.

A leaf of lettuce was just after placed before them. They seemed to like to be near it and very soon began to *nibble* at it.

They *wipe* the face with the paws much like a mature cavy.

Of the three constituting the litter one was from the first much larger.

The larger one was observed to get from its nest to the box, a distance of two inches, when not more than three and a half hours old.

2nd day.—At 1.30 p.m. one of the cavies was put into the box occupied by a rabbit. It did not approach or attempt to suck it. I am satisfied it recognized the creature as "strange."

It *eats* sugar from my finger and follows the finger by sight I think.

The eye must be almost touched before the winking inflex is produced.

3rd day.—*Nibbling* at green food.

4th day.—*Eating* green food.

7th day.—*Eating* food, oats and stale bread, and they seem, in most respects, to act like old cavies.

8th day.—One is taken to my laboratory for the purpose of brain study. On the way it *squeaks* a good deal.

They eat well, but follow up the mother at times to suck.

10th day.—They now eat as fast and well as mature animals, and in nearly all essential respects resemble them.

There seemed to be little more to record though they were kept to maturity. Other litters were also studied with the same result.

Remarks on the Diary of the Rabbit.

By a comparison of the records for the common and the pure-bred rabbits, it might appear that the latter were in some respects in advance of the former; but this is apparent rather than real I think, as in the common rabbit, observations were probably not made quite early enough in some instances

The marked development of *tactile* sensibility at so early an age in the rabbit is very noteworthy. The creature also responds unusually well as compared with other animals, as the dog and cat, to *pain-producing* stimuli.

While there is the same uncertainty as to taste and smell at birth and for a day or two, upon the whole the evidence is in favour of the rabbit being in *advance* somewhat of the dog and the cat in these respects.

The total absence of voice in the young is in harmony with the sparing production of sounds by the adult.

The movements of the ears, while more marked, are more akin to those of the dog than of the cat.

Movements are developed sooner in the rabbit and more rapidly become of the kind characteristic of the animal group than in the dog or cat.

The very early date (second day) on which scratching was observed illustrates the rapidity with which co-ordinated movements reach a considerable degree of complexity.

The very early date at which jerky movements are manifest and which are later represented by that rapid scurrying towards a burrow, etc., is noteworthy. Few animals equal the rabbit in this, and the early development of these movements affords another instance of what seems to be a general law—that those capabilities which are most important in the life of the creature appear early—at all events as regards qualities essential to the maintenance of existence.

It will be observed that by the seventh day taste and smell are well developed, and the movements of the fore-limbs, as in brushing the mouth, excellently co-ordinated.

Hearing and vision do not seem to be developed much sooner than in the cat or dog, but hearing especially, as in these creatures, reaches perfection rapidly.

In spontaneous attempts at eating the rabbit is very much in advance of the dog and cat.

There are very decided physical changes accompanying the psychic ones, many of which have been noted in the diary.

Remarks on the Diary of the Cavy (Guinea-pig). The Rabbit and the Cavy Compared.

The cavy shows so clearly soon after birth that it sees, hears, smells, tastes, etc., that it would be hazardous to assert that these functions do not exist at birth.

However, I think very close observation convinces one that they all require appropriate stimuli to develop them. That is to say, a cavy does not see, smell or taste as well during the first hour of its life as it does a few hours later, and marked as is the progress there is a real development, though the steps towards perfection are rapidly taken.

The contrast with the rabbit—not to mention the dog and the cat—in the condition at birth and the extreme rapidity with which perfection in all respects is attained is striking in the highest degree.

During the first five or six days of life the rabbit and the cavy are wide apart, though they both belong to the same great animal group.

After a month the psychic differences are slight, and at maturity they are physically much alike, though the rabbit is probably somewhat higher in the scale.

In the one case the development of body correlated with a certain psychic status and some peculiarities takes place *in utero*, in the other case

after birth, and that this contrast should be manifest among creatures in many respects so closely allied, both physically and psychically, is especially instructive.

Some excellent observations on the cavy will be found in Professor Preyer's "The Mind of the Child."

General Conclusions.

The investigations on the rabbit and the cavy illustrate sharp contrasts at birth and for some time after in animals that in mature life have much in common both physically and psychically.

The cavy soon after birth is able to care for itself and can maintain an independent existence.

The rabbit at birth is blind, deaf, incapable of any considerable locomotive power, and is, generally speaking, in a perfectly helpless condition.

But this creature attains to a condition of comparative maturity, physical and psychic, within a month, so that it is then quite capable of caring, in all respects, for itself. All its instincts, except the sexual, are in full development about this time or soon after.

In both the rabbit and the cavy, so simple is their psychic life that there is little to note by way of advance after they are a few weeks old.

After the first month of existence comparison with the dog, cat and allied creatures ceases to be suggestive. The rodents are left quite behind. They seem capable of little education either by man or by Nature. In other words, they get little from experience beyond that which strengthens their instincts and emphasizes their simple psychic life.

During this rapid psychic development physical changes of an equally rapid and decided character take place, and are undoubtedly correlated with the psychic changes.

XII.—*The Psychic Development of Young Animals and its Physical Correlation.*

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(Read May 16, 1895.)

VI.

THE PIGEON. THE DOMESTIC FOWL.

THE PIGEON.

So far as I am aware no investigations on birds of the kind set forth in this paper have been made, except in the case of the domestic fowl and the pheasant. As my observations on the pigeon are the most complete, they will be recorded first.

I have bred a large variety of pure-bred pigeons for many years and have kept notes on a considerable number of subjects relating thereto; but the following are the most complete consecutive records bearing on the psychic development of pigeons that I have made, and are accompanied with a fairly complete account of contemporaneous physical changes; and I trust that so long an acquaintance with pigeons may be some guarantee of correct observation and interpretation.

My pigeons have been kept in a large, airy, clean loft; have been well fed and provided with plenty of good water,—a most important matter in the case of pigeons.

They have been at liberty to fly out of the loft freely almost every day. As a matter of fact, the state of health in the entire loft has been good.

All of these things are, of course, of importance in interpreting the records that follow.

It seemed to me highly desirable that not only different breeds, but different individuals should be the subject of observation.

I would remind those not familiar with the habits of pigeons, that the male and female, unlike domestic fowls, pair up mostly for life if not interfered with, so that, speaking generally, a number of pairs may be kept in the same compartment of a loft without crossing, whether they be of the same or of different varieties when once they are thoroughly mated.

The male and female sit on the eggs in turn, and both take upon them the work of feeding, which consists of disgorging into the mouth

of the young, water they have swallowed and partially digested or softened food from their own crops.

During the first few days after the hatching of the young, the parents supply a secretion from their own crops, known popularly as "pigeon's milk," and which chemical analysis has shown lately to be a term not wholly inappropriate.

Diary of the Pigeons.

Owl Pigeon.

Hatched out by its own parents, that also fed and reared it.

When born the *eyes* seem to be closed.

2nd day.—On *touching* the back of the young one, it moves its head and opens its eyes.

3rd day.—It does *not wink* when its eyes are touched, and it is doubtful if it sees.

On touching the bird it moves more than it did yesterday, and now and then it opens its mouth a little.

On removing this one inch and three-quarters from its mate nestling, it *shifts back* again, guided chiefly by the warmth from its fellow I take it.

It is placed on a perch about 1½ inch wide. It does *not fall off*, but clings to it. When my hand is held within one inch and below it the bird puts down its beak, touches my hand and scrambles down into it.

Every time I use the dog whistle, the bird moves its head, which is a proof of *hearing*, for care is taken to exclude the contact of the blast of air from the whistle.

4th day.—It will, when placed on the perch as before, put its head down a great distance, but does not move from its secure position; but it does creep off into my hand under the same circumstances as yesterday.

5th day.—It *spreads* out its wings when disturbed in any way or when in danger of falling off the roost.

There is no evidence that the bird can distinguish objects by the eyes.

The winking reflex seems to be wholly wanting.

A solution of quinine and one of sugar are used to test taste, but with no clear results. When blown on, etc., it utters the *sounds* peculiar to young pigeons.

6th day.—The bird can see at a distance of one foot to-day, as evidenced by its movements when the hand is passed before it.

Holds its *eyes open* a good part of the time now.

Under the application to the tongue of solutions of sugar and of salt, there is some shaking of the head, which is possibly evidence of *taste*.

7th day.—Clear evidence of *vision* at two feet.

If the bird is placed anywhere out of its nest, it moves about in a restless way.

8th day.—Evidence of vision at four feet.

9th day.—Can now see objects distant six feet.

When the sides of the beak are touched, movements follow as if preparing to receive food.

10th day.—Objects now seem to be *visible* to the bird at any part of its own compartment of the loft, *i. e.*, at nine to ten feet.

To day, for the first time, is witnessed undoubted *defensive snapping* or pecking with the beak when the hand is brought near it, whether in its nest or on the floor of the loft.

Feathers are now grown out far enough to enable one to judge of their colour.

11th day.—Growth of feathers and general growth now considerable.

The bird can now walk fairly well.

12th day.—An improvement in walking and feathering noticeable since yesterday.

13th day.—When placed on the floor of the loft within a few inches of the nest, it attempts to *return* to the nest through some slats that fence it in. The nest is on the loft floor, and is covered with sawdust only now, though at first there was also a little straw.

15th day.—The bird can now get back to its nest when two feet away, and also succeeds in pushing between the slats.

16th day.—The parents have somewhat neglected the feeding of their offspring to-day, as they are preparing to sit again.

17th day.—Better fed to-day. When either parent enters the little compartment in which the nest is, the young one scrambles over a brick that surrounds the nest to *solicit* food.

19th day.—The bird is now well feathered.

When placed on the perch, it *clings* more firmly than before and in a different fashion—in fact, more like a mature pigeon.

27th day.—The bird is practically completely feathered.

34th day.—This owl-pigeon is leading a comparatively *independent* existence. It is out of its nest most of the time and *flying* about the loft, though occasionally fed by the parents, which are sitting on another nest of eggs (two).

Dragoon Pigeon Hatched Out and Fed by its Parents.

This one will be named B to distinguish it from another, C.

1st day.—Eyes unopened. The loudest whistle produces no effect. The bird is evidently *deaf*.

Blowing on it causes the bird to *move*. Putting its beak to one's mouth, it opens the former.

When placed on an elevated surface, it *does not creep or fall* off, though it moves its beak about, up, down, etc.

2nd day.—Responds to the dog-whistle to-day.

Eyes open, but usually kept closed.

3rd day.—Eyes more completely open, but lids are usually held closed

5th day.—Keeps its *eyes open* most of the time.

It can now hold up its head pretty well, which is an impossibility in all pigeons just after birth.

6th day.—The eyes are kept open nearly all the time, and the *head* held better—in fact, well.

7th day.—Progressing, but as yet does not peck with the beak at the approach of an intruder.

9th day.—Does snap with the beak to-day, but does not peck.

10th day.—Pecks to-day.

11th day.—Feathers shooting from the skin, but it is difficult to determine the exact colour yet.

12th day.—A great advance in growth and feathering in twenty-four hours.

When one approaches, it *pecks* hard, and uses its wings offensively also.

13th day.—*Colour* of the bird, though one not naturally easily made out, is now clear.

14th day.—When taken from the small compartment in which its nest is, it walks back promptly and well.

15th day.—The *wings* are well covered with feathers.

18th day.—The bird does not peck when approached, but shrinks.

When its *wings* are drawn out it pulls them in again (as did the owl-pigeon on the 22nd day).

20th day.—Shrinks to-day, but when it gets back into a corner of its nest it then pecks vigorously.

24th day.—Behaviour similar to that of 20th and following days.

28th day.—Out of the nest, looking after itself to a large extent, and beginning to *fly*.

34th day.—The *iris* is turning red. Hitherto it has been of a dull, ill-defined colour.

Another Dragoon Pigeon, C, of Different Parentage.

Though the diary was kept in the same way as the previous one, only such parts of it will be given here as serve to bring out something new or to mark individual differences.

1st day.—I could get no definite reaction to tests for taste or smell.

Eyes held closed, but can be opened.

4th day.—Holds its head somewhat differently from B.

When *touched* turns reflexly towards the source of the stimulus.

11th day.—B has in twenty-four hours been the subject of a phenomenal growth and advance in physical development generally, so that it now seems days in advance of C.

16th day.—Very *pugnacious* when approached.

20th day.—Strikes vigorously with beak and wings. It desists when when placed in the hand, but is as bad as ever when put down again.

22nd day.—When striking at me it got sawdust into its mouth. This was promptly *ejected*, however.

28th day—Out of the nest and *flying* about as the other one.

Short Faced Tumblers, D and E.

Unless otherwise stated the notes refer to D.

1st day.—The *eyes* are fairly open.

The opening of the ear is very small.

2nd day.—E can *sit up* fairly when it does not attempt to move, but if it does it sprawls about badly. The head seems too heavy and its neck too long ; but it is a vigorous specimen of this somewhat delicate variety.

3rd day.—When the wing is pricked the head is dipped downward and forward somewhat forcibly, but not towards the side stimulated.

6th day.—The head and neck are well supported.

The eyes are still held open only *part* of the time. The parents sit over the birds at eventide though very hot in the loft.

7th day.—The eyes held open almost all the time. *Does not wink* even when the eyes are touched.

10th day.—Much growth and general advancement evident.

13th day.—The bird *pecks* when I put my hand near it. The growth of feathers is just now slight, but that of the body rapid.

14th day.—Still more inclined to peck, etc. Can see growth in twenty-four hours.

15th day—Pecks vigorously. I placed it on one hand, and on extending the other towards it the bird no longer pecks, but uses *voice*, beak, etc., as when its parents approach to feed it.

16th day.—After being on my hand it is placed back in the nest and then behaves as noted above on the fifteenth day.

17th day.—It is now growing rapidly and *feathering* fast, so that the colour can be made out. Though quite pugnacious before, when taken in the hand it grows quiet.

19th day.—The bird is now about one-third feathered. When approached it uses beak and wings as before, but a touch seems to quiet it.

20th day.—The most pugnacious it has yet been.

22nd day.—Still more pugnacious.

24th day.—Can notice a distinct advance in growth and feathering since yesterday.

26th day.—Does not peck, etc., to-day.

27th day.—Pecking again.

29th day.—It is to-day standing on a brick that is beside the nest and still pecks.

34th day.—It has begun its independent existence to-day and is *flying* in the loft, picking up grain, drinking water, etc.

Its *iris* has begun to take on the final characteristic "pearl" colour.

Remarks on the Diaries of the Pigeons.

I have intentionally made records on different varieties of pigeons in order that it may appear to what extent they resemble and differ in their psychic and physical development.

The resemblances are more readily apparent from the perusal of records than the differences, as many of the latter are of a kind readily enough recognized by an experienced observer, but not easily represented by verbal descriptions.

Special pains were taken to ascertain whether the sense of support, as I have called the quality, is present in birds as in mammals.

From the records it will be seen that it is well marked.

The young bird placed on a perch feels about, as it were, with its beak for some solid object, and not finding it, remains where it is, but if it touches anything resisting, it begins to move towards it.

The lower an animal in the scale the more difficult it seems to be to establish the presence or absence of taste and smell at an early period, if I may judge from those of our domestic animals examined by me.

I am unable to speak with certainty as to whether pigeons within the first two or three days possess these senses or not; but that later they do, I have abundant evidence.

Tactile sensibility and the ability to feel pain are present just after hatching, as my records show that even a breath of air gently blown on the young pigeon causes it to move.

Additional evidence is furnished by the fact that a gentle stroking tends to quiet the bird.

They are highly sensitive to warmth and cold. One can quiet the most disturbed and pugnacious young one by gently holding the warm hand, a warm cloth, etc., over it.

A single cold day is liable to kill young pigeons if their parents do not sit over them constantly and sometimes even when they do. The essential vital processes of the body seem to be deranged by cold.

The eyes, though shut for the first day or a greater part of it, can be opened forcibly. Nevertheless, the slit between the lids is at first very small. There is no doubt, in my mind, that pigeons are blind at birth.

The records show that they can soon see, and so early as the sixth day can distinguish objects at the distance of one foot.

The diaries give facts which will enable one to note the rate at which progress in this direction takes place. By about the tenth day the pigeon's vision for objects anywhere in a good sized loft is excellent.

The practical absence of the winking reflex in young pigeons is noteworthy. However, it is not easy to cause mature birds to wink. Moving an object before its head when the bird is held in the hand causes movement of the head rather than winking.

The pupillary reflex is, however, soon and well established in birds.

There is no doubt that the newly hatched pigeon is deaf; but I have found that hearing may be demonstrated on the second day in some cases.

It is very rare, indeed, that pigeons manifest any signs of hostility, etc., when caught up in the hands.

Birds sitting on the nest will sometimes, however, peck vigorously, and the early age at which this pecking or snapping of the beak is exhibited, seems to me noteworthy. It illustrates how purely instinctive the matter is. It reminds me forcibly of the hissing of the young kitten, the more so as both are often evidences of surprise rather than real hostility.

I have not noticed that the newly-born pigeon has voice, but after a few days (five in one case) the bird "squeaks" on the approach of the parents and especially when being fed.

Later the voice is used under such circumstances very persistently.

At first the young pigeon can scarcely sit up in any fashion, but in a few hours this is possible, the greatest difficulty being the management of the head and neck, which often fall to one side or forward.

The gradual progress in motor power and co-ordination has been fully noted in the diaries.

By-and-by the young pigeon recognizes its own nest when near it, and when alarmed will retreat to it. This is a matter of vision largely, though, as noted in the case of the young rabbits, there may be some sort of memory of distance and direction through tactile and muscular sensibility or otherwise. The subject is obscure and worthy of more study.

So close is the relation between psychic and physical development, that from the appearance of a bird one who has observed closely could be able to predict its behaviour; and this seems to me to be undoubted evidence of some sort of correlation between the physical and the psychic. Now and then it will happen that from one pigeon having been hatched a few hours in advance of the other, by its being better able to persistently thrust forward its beak for food to the parents, it fairly starves the other one, or, if not completely, to such an extent that the difference in both physical and psychic development is very striking. Again, owing

to innate vigour, one of the two birds in the nest may make a sudden advance, as was noted in the dog, in which case the same result as just referred to follows.

There are many signs of development that appear progressively, such as changes in the shape of the skull and beak, the method of holding the head, the relative proportion of parts, etc.; but upon the whole the rate of feathering is a fairly good guide to progress, both physical and psychic.

Though differences between the mature forms of varieties of pigeons, so pronounced as regards physical form, less so psychically, but still real and always present, are obvious to even a superficial observer, it is interesting to note that even at an early date such differences do appear. To illustrate: the dragoon is a bird of a very bold appearance, and as compared with many varieties, is somewhat wild. It has been spoken of as the "game bird" of the pigeon family. Such characteristics are manifest in the young before they are twenty days old. They peck sooner and more vigorously in the nest. They are shyer of approach, etc.

This cannot be explained by a more rapid development, for several other varieties mature sooner than they do.

Changes in the colour of the iris are as significant, it would seem, as in mammals.

Some Conclusions.

Pigeons, when hatched, and for the first day or two, keep their eyes mostly closed, though the eyelids are not actually united at birth.

They are both blind and deaf when they first emerge from the shell, and for a certain period afterwards.

Perfection of hearing and vision are gradually but rapidly acquired.

Taste and smell cannot be demonstrated at birth, but can be shown to exist some days later.

From the first tactile sensibility and capability for painful sensations exist in exquisite development.

Pigeons, even more than mammals, seem to be sensitive to heat and cold.

The sense of support is very fully developed almost or quite from the beginning.

Voice is present in a few days after hatching.

Motor co-ordinations peculiar to birds and the power of recognizing their own nest, parents, etc., are gradually but well developed.

Physical changes peculiar to this group of birds, and with modifications for each variety, occur at fairly definite periods, are closely related in time and are probably in some way bound up with psychic changes.

The Domestic Fowl.

This bird is so different in many respects from the pigeon that I have thought it better to keep the notes I have taken apart.

These observations were made on pure-bred Andalusian chicks, though many others have been studied.

Diary.

Chick A, hatched out some time before daylight is taken from the nest for the first time and tested at 4.30 p.m.

It *pecks* three times in succession at a very small speck on the table and *touches* it each time. It strikes a crumb about $\frac{1}{16}$ inch in diameter two or three times and then *swallows* it.

Soon after it pecks at a smaller crumb, and takes it up and swallows it on the first attempt.

It also pecks accurately at a dark *spot* on the table.

Chick B, of about the same age (same hatch), *picks* up bread crumbs and particles of hard-boiled yolk of egg without missing.

It also pecks at its own *foot* and the *nail* of one's hand.

Chick C, hatched only a little while since, seems feeble, creeps rather than stands, and is soon tired out.

All those tested do, without doubt, *hear* as well as *see*.

They easily follow the hand by the eyes at a distance of six inches.

Can get the winking reflexes only when the eyes are all but touched.

A dark-coloured box, a piece of cotton and the hand are brought near the chicks in succession. The hand alone is followed, showing that it is the *warmth* that attracts.

Solutions of salt and sugar applied to the tongue produce no decisive signs of the possession of taste.

Two pigeons—the one a White Pouter, the other a Black Owl—were brought near to test whether the chicks would show any instinctive fear. They manifested none whatever; on the contrary, they would *nestle* under them.

The birds are tested again about twenty-two hours later.

Previous to the first testing they had not been from under the hen, and since then they have been under her and nowhere else.

The three chicks now peck well at all that is put before them, as oatmeal grains, canary-seed, etc. They peck readily and touch the objects successfully. The hardest objects are not always taken up at once, however.

Some scales of dried lime-wash from the wall are placed before the chicks. In one case a chick pecks at a scale several times, then gets it into the mouth, but only to *eject* it.

In another case it is not distinctly taken into the mouth and expelled, but is simply picked up and at once *dropped.*

Water is presented to the chicks. They peck at some *drops* on the side of the tin containing the water.

They accidentally get the beak into the water, when drinking follows.

They do not spontaneously put in the beak and drink either before this accidental result or after, and in this matter they all three behave alike.

They are seen to *scratch* the head with a foot.

At this age another lot of six, which are with a different mother, do *drink* on invitation (clucking) of the mother.

They also eat rather better on her invitation than without it.

They run to the mother from a distance of four feet.

Five hours later.—The mother hen drinks, whereupon two of the chicks run rapidly from a distance of six inches and *drink.*

One of them *wipes* its beak on the ground.

The hen is later in a box, and cannot be seen by the chicks, yet they move towards her, *i. e.*, in the *direction* of the sound she makes.

3rd day, 2 p.m.—They have been fed a couple of times before to-day.

They are now given very small pieces of meat, with which they run off, *peck* it against the ground, and make off from each other as does a mature hen. One even escapes through wire netting into the next "run." They are now out of doors in suitable "runs."

One is seen to swallow a piece too large with no more difficulty than a mature bird apparently.

One of the chicks begins to eat lettuce on which the mother hen is feeding.

A pigeon (the same one used before) is thrown into the run where the hen and chicks are. It flies about a little and then alights. The chicks did not show the least fear, etc., though the hen attacks the pigeon, uttering a faint sound (danger signal) peculiar to fowls when a bird, as a hawk, flies over them.

9th day.—Feathers shooting out well. Differences in colour very marked.

14th day.—Tried the black owl-pigeon as before. No special manifestations on the part of the chicks, nor were there any when the other of the two pigeons before tried was suddenly thrown into the run and fluttered about.

Remarks on the Diary of the Chicks.

Previous to writing the notes on the chicks that were the subject of the present paper, I had observed fowls, young and old, from boyhood.

The brilliant and suggestive observations and experiments of Mr. Douglas Spalding had fallen under my eye, and the criticism of his work by so good an observer as Professor Preyer determined me to make some special independent observations.

I had the impression that Spalding's statements ("Macmillan's Magazine," February, 1873, referred to also in Romanes "Mental Evolution") were somewhat overdone.

My own observations confirm that suspicion, and justify Preyer's criticisms ("The Mind of the Child"), so that I am of opinion that Spalding's statements require revision, though reliable in the main.

Different chicks behave in a way sufficiently unlike to warrant differences of opinion in detail, and one should be on his guard against statements of a too sweeping character. My own observations, etc., on the chick agree pretty well with those of Professor Lloyd Morgan on young pheasants ("Nature," vol. 50, p. 575).

It will be seen from my records that even in the same clutch of chickens there are marked individual differences. Thus one may strike a crumb accurately every time it pecks, and pick it up on the first attempt; another misses or shows great difficulty in getting it into the mouth.

But few remarks are called for in the diary in view of what has already been published on the chick by others.

I call special attention to the failure of the chicks to be frightened at any time within my records (fourteen days) by the pigeons placed amongst them in a way that one would have supposed might have called forth any instinctive dread of a rather large flying bird.

My own impression is that chicks do not in all cases show fear when the shadow of a bird, as a hawk, passes over them. In other words, instinct is not the hard and fast thing it is sometimes supposed to be.

The sense of support, not referred to by other observers, is well marked.

The chick is very sensitive to cold, though I think less so than the pigeon, except in, perhaps, the case of the most delicate varieties, as pure-bred bantams.

Some Conclusions on the Chick. The Chick and the Pigeon, etc., Compared.

The chick when it emerges from the shell or very soon afterwards, certainly within a few hours can see, hear, taste, pick up and swallow food, drink, run about, etc.

Its progress is so rapid that in a few days it can lead an independent existence, provided it be protected against cold, wet, etc.

The chick stands to the pigeon in physical and psychic development in somewhat the same relation as the rabbit to the cavy or guinea-pig.

In all these cases, when full maturity is reached, the psychic difference is not great. The rabbit and the cavy are about on the same mental plane and so are the pigeon and the fowl.

They all illustrate general laws of development and the study of these creatures, somewhat low in the vertebrate and psychic scale, seems to me to throw much light on the problems of psychology, viewed not as human psychology alone, but in the broadest possible sense.

XIII.—*Traces of the Ordovician System on the Atlantic Coast.*

By G. F. MATTHEW, D.Sc.

(Read May 25, 1893.)

In the early history of the geology of the maritime provinces of Canada the distinction between the different grand divisions of the Palæozoic rocks was not very clearly drawn.

This arose partly from the fact that the earlier geologists drew no distinction between the Cambrian and Lower Silurian (Ordovician) or between this and the Upper Silurian; and partly because all the Palæozoic deposits, except the Carboniferous, had been greatly disturbed and folded in almost every part of this region. Owing to these disturbances there exists here a confused complex of the older and middle Palæozoic that is difficult to unravel.

But the want of sharpness and accuracy in the several divisions of the Palæozoic rocks has also arisen from the scarceness of well preserved fossils, whereby these divisions and their several parts could be distinguished from each other.

Latterly, and by slow degrees, group after group of the older Palæozoic rocks have been recognized, and the earlier classification improved. First, Dr. Abraham Gesner distinguished the Silurian (Upper) of the northern part of New Brunswick; then Sir J. W. Dawson claimed the existence of Silurian (Upper) and Devonian in the valleys of Cornwallis and Annapolis in Nova Scotia; at a later date Dr. D. Honeyman collected the Silurian (Upper) fossils of Arisaig, N.S., which were described by Jas. Hall, and the Cambrian fossils of Mira River, C.B., recognized as such by J. W. Salter. At a later date the officers of the Geological Survey discovered Silurian fossils at Winthrop Station, N.S.

Meanwhile the Cambrian rocks of St. John were determined as such by the discovery of a distinctive marine fauna; and the Devonian age of plant-remains of Lancaster was asserted by Sir Wm. Dawson. Subsequently the officers of the Geological Survey distinguished by their fossils the rocks of various Silurian (Upper) areas in New Brunswick.

But among all these no trace of an Ordovician fauna had been obtained. The first step in this direction was the discovery (1880) of fossils of this age in certain quartzites and siliceous slates on the Becaguimic River in the northwestern part of New Brunswick. These were a species of *Harpes*, a *Leptobolus*, another Brachiopod resembling *Leptella* (?) *decipiens*, Bill.,[1] and other fossils, undetermined. To the southwest of

[1] Rep. Prog. Geol. Surv. Can., 1885, Rep. G, p. 25.

this locality, on the line of strike of these slates, in the state of Maine, graptolites of the age of the Llandeilo rocks were subsequently found, showing the extension of a band of Ordovician slates southwest into the state of Maine. Subsequently the same band was traced eastward through New Brunswick to the Baie Chaleur. Thus was established the existence of a belt of Ordovician rocks crossing northern Maine and New Brunswick, southward of the belt of Silurian (Upper) rocks discovered by Gesner.

Ordovician strata were next discovered in southern New Brunswick at St. John, where there are beds with Arenig graptolites infolded with the Cambrian rocks of that place. As these beds with graptolites are an integral portion of the upper division of the St. John Cambrian terrain, it is evident that there is here a second belt of Ordovician rocks in New Brunswick.

But though we have been able to recognize two bands of these rocks in the province above named, no Ordovician strata have yet been determined in Nova Scotia. It is true that Dr. Honeyman had claimed that the fossils of Wentworth Station were Lower Silurian, but this view was contested by Mr. Billings, who could find here nothing older than the Clinton Group.

On examining the fossils sent me by Mr. Howley from Newfoundland, and referring to notes made some years ago on others collected in Cape Breton by the officers of the Geological Survey of Canada, it became evident to me that still another belt of these rocks existed along the Atlantic coast. This belt has remained unrecognized owing to the scarcity, and, in many cases, the bad condition of the fossils.

The fossils more recent than the Cambrian in southeast Newfoundland, are those of Great Bell and Kelly's Islands in Conception Bay. Mr. Billings described some of these many years ago, but he left undetermined the genera of his species which I describe below. Under modern methods of determining genera, it becomes necessary to know something of the interiors of the Brachiopods, and as these are not described nor figured by Billings for the species in question, I sought from Mr. Howley an opportunity to examine those in the museum at St. John's, and from Mr. Whiteaves, those at Ottawa.

The declared age of the rocks containing these fossils has been governed by that of the adjoining and very characteristic Cambrian faunas (in Newfoundland, Lower Cambrian, in Cape Breton, Upper) and so the indications of these rare and obscure genera of Palæozoic type later than the Cambrian, has been overlooked. In Newfoundland, the Ordovician or Silurian rocks are, in Kelly's Island, gray micaceous sandstones, and in Great Bell Island, pale gray, white-weathering, coarser sandstones, dipping at a low angle; while the Cambrian rocks of the mainland adjoining are shales with limestone beds and dip at a higher angle.

In the Island of Cape Breton the rocks of the shore of Bras d'Or Lake, near Barrosois Brook, consist of various alternations of sandstones, slates and shales.[1] Some of the shales, away from the shore, on the Barrosois or McLeod Brook, contain *Dictyonema flabelliforme*, and are therefore Upper Cambrian. The coarser beds on the shore of Bras d'Or Lake which contain the fossils described below are more modern, as will appear by the following review of their fossil contents.

In the following description the fossils are arranged according to their zoological standing.

LINGULIDÆ.

LINGULELLA. Salter.

In the collections examined there are two species that may be referred to the above genus, although the impressions of the sliding muscles are more external than Mr. Salter has declared to be the case in the Welsh species, *L. Davisii*, the type of the genus. The Canadian species were collected in Cape Breton and occur in a calcareous sandstone which has suffered from dynamical movements, and the fossils are all considerably distorted: the figures of the species are adjusted for this distortion.

LINGULELLA SELWYNI, n. sp., Pl. I., Figs. 1*a* and *b*.

The form is sub-ovate, broadly rounded in front, but having nearly straight sides in the posterior half; the beak of the ventral valve is regularly pointed and that of the dorsal bluntly rounded.

The ventral valve in its interior, exhibits two large, triangular scars, where the central muscles were attached, one on each side of the rhombic pit in the posterior third of the valve. The posterior adductors appear on each side of the hinge area, and there are sliding muscles exterior to and in front of them. In front of the posterior adductor muscle, on each side of the valve, there is a low ridge extending forward as far as the scars of the central muscles: at and in front of these ridges the imprint of the main vascular trunks is visible, extending forward toward the median line.

The interior of the dorsal valve has a broad scar (posterior adductor ?) just in front of the striated hinge area, and on each side of the hinge are impressions of sliding muscles. The central muscles are indicated by a group of small pits near the centre of the valve; of these the anterior adductors are oval and somewhat apart at the mid-length of the valve; the anterior adjusters are indicated by a pair of small rounder pits, a little in advance of those last named and closer together. A faint line (indicating the border of the splanchnocœle ?) includes these scars and

[1] Geol. Surv. Can. Rep. Prog., 1875-6 (Fletcher's Report), p. 389.

runs back toward the posterior part of the valve. Extending forward from near the cardinal area on each side are the lateral ridges and the imprint of the vascular trunks, as in the ventral valve, but here more distinct and bearing a number of branches directed, some inward and some outward.

Sculpture.—The external surface of the valve of this species is marked by fine concentric lines, and fainter radiating lines; there are also at intervals, concentric growth lines, and less distinct undulations of the shell, radiating from the umbo.

Size.—Dorsal valve. Length and breadth, each about 11 mm. The ventral valve is about 1·5 mm. longer.

Locality.—McFee's Point, George River, Cape Breton, collected by Messrs. Weston and Robert, of the Canadian Geological Survey.

The plan of the muscular scars of this species is very nearly that of *Obolus Quenstedti* of A. Michwitz, found in Esthonia, Russia,[1] and as we find a shell in the Lower Cambrian of the St. John Group which possesses all the essential characters of an Obolus, but differs from this shell, we fully agree with Messrs. Hall and Clarke, that *O. Quenstedti* could, with propriety, be excluded from Obolus; whether it should go into Lingulella will be better known when the internal features of the species *L. Davisii*, the type of that genus are more fully described.

LINGULELLA ROBERTI, n. sp., Pl. I., Figs. 2*a* and *b*.

Broadly ovate, the ventral valve acuminate, having a low mesian ridge in the posterior third, and slightly upturned at the beak. The dorsal valve tumid posteriorly, with a narrow hinge-margin, the valve has a mesian grove in the posterior quarter, and is flattened toward the front.

In the ventral valve the inner surface of the thickened posterior part of the valve carries two pairs of diverging ridges, the inner pair terminating at the scars of the anterior adductors, the outer pair of about equal length, but continuous with impressions of the curving vascular trunks.

The dorsal valve also has in its interior four diverging ridges; within the two outer ones at the back of the shell is the impression of the posterior adductor muscle; and within the two inner ones, one-third from their ends, are the oval pits of the anterior adductors; between these scars, and extending backward in the valve, is a faintly marked mesian ridge, placed about one-third from the posterior end of the valve. The pits of the anterior adductors diverge somewhat at their anterior ends, and a short distance in front of them are two small, round pits, near together, which mark the points of attachment of the anterior adjustors.

Sculpture.—This consists of irregular concentric striæ which inosculate with one another, producing a surface of broken ridgelets, similar to

[1] Genera of Palæozoic Brachiopods, Hall and Clarke, p. 337, figs. 38 and 39.

that of an Acrothele; the concentric ridges are of unequal size, and there are occasional more distinctly marked growth-lines.

Size.—Length of the dorsal valve, 13 mm.; width about the same; the ventral valve is about 1·5 mm. longer.

Locality.—Same as the preceding. Found in a sandy limestone by Messrs. Weston and Robert.

This species is very little larger than the preceding, but is distinguished by its radular ornamentation and thicker valves; also by its acuminate upturned beak, its tumid dorsal valve, and by the position of the central muscular scars of this valve; these scars are in the posterior half of the valve, but in *L. Selwyni* about the middle of the valve.

Mr. J. F. Whiteaves has very kindly loaned me for comparison with the Lingulellas of the Ordovician of the Atlantic coast, examples of a Linguloid shell from Beverly, Ontario. Some of these shells show the interior surface of the valve, and are described and figured to show the distinctness between the genera Lingulella and Lingulepis in the position of the muscular imprints, etc.

LINGULEPIS, Hall.

LINGULEPIS ACUMINATA, Conrad, Pl. II., figs. 5*a* and *b*.

Lingula acuminata was originally described by T. A. Conrad from specimens found in boulders from the calciferous sand rock [1] of the State of New York. The specimens, however, are very much smaller than the Canadian shell I am about to describe, and differ considerably in form; still Mr. Walcott appears to recognize Conrad's species as identical with the species from the Upper Cambrian near Saratoga, described by him, some examples of which are represented as attaining the size of the Canadian form; and further he compares the Saratoga form with *L. pinnæformis*, which evidently is congeneric with the Canadian form. The western species, however, is more prolonged at the beak than the examples of *L. attenuata* figured by Dr. Hall, or than those of the Canadian form.

It is chiefly the internal characters of the Canadian shell that will be described:

The ventral valve appears to have no area, but finishes with a rim similar to that of other parts of the shell. Near the umbo there is a narrow extension of the visceral callus upon which is a small scar of the cardinal muscle. Extending forward on each side of the narrow part of the callus are bands along which the lateral muscles travelled during the

[1] Palæontology of New York, vol. i., p. 9, fig. at bottom of the page.

growth of the shell: they are three in number, and perhaps are only the outer laterals, for on the inner band (transmedians?) no scars have been detected.

The central muscles (anterior adductors, etc.) rest on a quadrangular shield, considerably in advance of the laterals: each set is included in a somewhat pear-shaped area, which has an elliptical scar in front, and a deep, narrow scar on the inner side. The front of the visceral cavity probably is indicated by an isolated scar half way between the central scars and the anterior margin. The vascular trunks on this valve have not been observed.

The dorsal valve is obovate and has broad, flat, lateral margins, that were partly external to the edges of the ventral valve.[1] A visceral callus of the shell at a young stage shows lobed divisions, produced by the advance of the central and lateral muscles as in *Lingulepis pinnæformis*: outside of these we see the lines of progression of the same muscles over a shell surface from which the visceral callus has been exfoliated; on this surface are exhibited the imprints of the central (anterior adductor) and interior lateral (transmedian?) muscles: the position of the anterior adjustors is indicated at the point of the impression of the visceral callus in front of the centrals. The vascular trunks sweep forward from the sides of the shell, with a slight curve toward the front, and are separated by a space marked with vascular lines; no branches were observed.

The anterior parts of both valves are abundantly marked by the fimbriated edges of the mantle margin.

Sculpture.—Externally the valves of this species appear to be smooth, except for the numerous concentric raised lines of growth; these are particularly numerous on the convex posterior portion of the ventral valve. A lens of half-inch focus exhibits a minutely cancellated surface on the lateral slopes of the valves.

Size.—Length of ventral valve, 18 mm.; width, 14 mm. The dorsal is 2 or $2\frac{1}{2}$ mm. shorter.

Horizon and *Locality.*—Pale brown sandstone from Beverly, Ont.

This species exhibits affinities to Lingula rather than Lingulella; as witness the absence of an area on the ventral valve, and the transverse position of the anterior adductor muscles of the dorsal valve. Among species whose interiors have been figured, that of *Lingulepis pinnæformis*, Hall, closely resembles that of the Beverly form.

The course of the vascular trunks and the attitude of the muscular scars of the central group easily distinguish this genus from Lingulella.

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[1] The features of this valve are described from several different specimens, no single valve having been found in which all were visible.

LINGULA, Bruguiere.

LINGULA HOWLEYI, n. sp., Pl. I., Figs. 3*a* and *b*.

Among the fossils sent me by Mr. Howley was a large Lingula of peculiar shape.

General form quadrate, with obtuse cardinal slopes, apical angle about 105°. Sides nearly parallel, spreading slightly toward the front, anterior angles obtusely rounded, and having the front, for half its length, straight. The surface of the valves for nearly one-quarter of their width, on each side, is flattened—concave.

The ventral valve has a broad rounded ridge along the middle, which descends at four-fifths from the front of the valve, somewhat abruptly, to the front edge ; the lateral thirds are concave, especially toward the beak, and the posterior edges of the valve are bent down or involute ; apex bluntly rounded.

Some features of the interior appear on the abraded surface of the valve examined. Two widely diverging ridges spread from the umbo toward the lateral edges, their ends being more than half way to the front of the valve, and about one-eighth of the width of the valve from its edge. About midway of the valve a rhombic area is outlined, at the front of which, on each side, would be the place of the anterior adductor muscles.

The dorsal valve has the same outline as the ventral, but the edges of its posterior slopes are revolute, forming a channel on the outside of the shell at its back. The raised central part of the valve is wider in front than that part of the ventral valve.

An abraded example of this valve shows imperfect traces of the pits of the posterior adductor and of the lateral muscles, and an imperfect outline of the visceral cavity.

Sculpture.—Only small fragments of the outer surface of the shell have been preserved ; these show that the surface was ornamented with numerous concentric, rounded ridges ; and under a strong lens the surface appears to be minutely granular.

Size.—Length, 35 mm. ; width, 22 mm.

Locality.—Micaceous gray sandstones of Kelly's Island, Conception Bay, Newfoundland, in company with *Lingula Billingsiana*, Whiteaves.

This shell changed its form considerably during growth. When it attained the size of 8×11 mm. it was of a regular oval form, like *L. Quebecensis* and several others of its genus, but then began to grow quadrate. When three-quarters of its full length it was more rectangular than *L. quadrata*, and continued to grow more quadrate until it reached maturity.

We know of no Cambrian Lingula to which this Newfoundland

species can be compared or referred ; its great size is unparallelled among the species of that age, and only as early as the Ordovician time do we find similar large Lingulæ ; none of these, however, agree with *L. Howleyi* in form. The well known *L. quadrata* is much less rectangular, and its cardinal slopes are more acute. *L. quadrata* is found in the middle and upper part of the Trenton, and in the Baltic provinces of Russia appears (by de Verneuil's localities) to occur in beds equivalent to the Llandeilo Group of Britain. *L. Canadensis* of the Hudson R. beds in Anticosti is another large quadrate species, but it is a third wider, and has a cancellated surface. *L. Nympha* of the Chazy beds of northern Newfoundland is one of the oldest of these large Lingulæ ; but it is longer and narrower than our species. *L. Quebecensis*, another large species of the Quebec group (Arenig horizon), is regularly oval. A species which in its general form appears to be nearer our species than any other is *L. Lewisii*, Sow.[1] This is said to be somewhat smaller than the Newfoundland species, but it has similar obtuse beaks and parallel sides. Following the biological indications given by *L. Howleyi*, the sandstone in which it is found cannot be older than the Ordovician time. But it is probably even younger, for there is no species that more closely resembles the Kelly's Island Lingula than *L. Lewisii*, Sow. Sowerby's species is found in the middle and upper part of the Silurian (Upper) in the west of England. This resembling species from Newfoundland shows even more strongly the variation to a quadrate form, and is perhaps fully as modern as the English shell.

This species is named in honour of J. P. Howley, director of the Geological Survey of Newfoundland.

TRIMERELLIDÆ.

Among the Brachiopods received from Mr. Howley were some large thick shelled species, examples of some of those which had been described by E. Billings, and which this author had provisionally, but doubtfully, referred to Lingulella.[2] They are larger and thicker than the known species of Lingulella, and their deep muscle-scars, incipient partitions in the umbo and other characters appear to ally them to the Trimerellidæ ; but it does not seem possible to refer them to any described genus.

LINGULOBOLUS, n. gen.

A rather large inarticulate brachiopod, valves thickened around the visceral cavity ; the thickened portion consisting of successive plates, but there is no true vaulted platform. The borders of the thickened part of

[1] I am indebted to Mr. G. Van Ingen, of Columbia College, N.Y., for copies of Mr. Davison's figures of this species.

[2] Palæozoic Fossils, vol. ii., pt. i., p. 67, figs. 35 and 36*a-c*.

the shell, or pseudo-platform are raised, and there is a median plate or septum. A band similar to a crescent goes around the back of the shell within the deltidial area, and connects a set of three lateral muscles. The arrangement of the muscle-scars, especially the centrals, is like that of Lingulella, of the laterals like Trimerella and the parietal bands have the position of those of Lingula. The notation used in describing the parts of this and of the following species, is that of Davidson and King for the Trimerellidæ. The type of the genus is *Lingulella* (?) *affinis*, Billings.

LINGULOBOLUS AFFINIS, Bill., sp., Pl. I., Figs. 4*a* and *b*.

Lingulella (?) *affinis*, Billings, Palæoz. Fossils, vol. ii., pt. i., p. 67, fig. 35.

Mr. Billings's description of this species is as follows:

"Ventral valve elongate, conical, or acutely triangular. Apical angle 45°. Front margin gently convex in the middle, rounded at the angles; sides nearly straight, uniformly converging from the anterior angles to the back. Surface of very fine, longitudinal striæ, about ten in the width of a line. This species is founded on the single specimen of a ventral valve above figured. The upper two-thirds is partly worn away in the middle, leaving only the outline in the stone. It appears to have been, when perfect, gently convex, the rostral portion near the beak, semi-cylindrical. Length about thirteen lines, width nine lines. The dorsal valve has not been identified."

Among the specimens from Great Bell Island received from Mr. Howley are some examples of a large shell which, though it differs in its proportions from Billings's figure of *L. ? affinis*, I believe to be this species, for while he speaks of the apical angle as being 45°, it is actually as drawn, 55°. The type specimen is perhaps narrowed by pressure. The internal markings of the shell sent me by Mr. Howley are so well shown, that whether this shell is or is not *L. ? affinis*, it is worthy of description. These internal markings are as follows:

In the dorsal valve the cardinal muscle is divided, and is close to the margin; in front of this muscle on each side are the oval scars of a large pair of lateral muscles; these scars have a pointed anterior lobe, and extend forward to a point one-third of the length of the shell from the hinge-line; in front of these scars is a faint, oval incurved impression (muscle scars ?) extending half way to the front of the valve; these form on each side of the valve the anterior end of the crescent. The central muscles form a group of scars just behind the middle of the valve; there are two large laterals and a group of small central muscles about as distant from the laterals as these are from each other: the small central group is resolvable into four little scars; the two posterior contiguous and parallel; the two anterior approximate, but spreading anteriorly. A

pair of minute (sub-cardinal ?) muscle scars lie about half way between the cardinal muscles and the large laterals of the central group.

A pair of vascular trunks extend from inside the lateral scars, forward for some distance beyond the central scars, angling inward: from the inside of these trunks, about six branches extend toward the centre of the valve, and finer branches radiate from their outer edges. The edges of the valve and the growth ridges of its outer surface are marked by numerous crenulations or furrows directed outward.

The ventral valve is more elongated than the dorsal, and in some examples has a wide, faint depression along the centre of the deltidial area. A triangular area on each side of the valve extending two-fifths from the apex marks the position of the lateral muscles; at the back of the triangle is the scar of the umbo-lateral, and at the outer corner is a group of three small oval scars, constituting the main lateral group of the crescent. The rhombic pit marking the position of the central group of muscles has a crenulated band along its centre due to the central muscles, and on each side are the prints of the laterals.

The crenulations of the margin of the shell, where the vascular lines terminate (marked on the outside of the shell by radiating striæ) are about as far apart as the striæ on the outer surface spoken of by Mr. Billings. There is a slender median ridge to the valve, and on each side of this a calcareous thickening of the valves marking the edges of the pseudo-platform. The crescent in this species is of the nature of a parietal band as it incloses the muscles and does not form a broad band in which the muscle-scars are inclosed as represented in the figures of Messrs. Davidson and King for Trimerella.

Var. CUNEATA, Pl. I., Figs. 4*c* and *d*.

Among the examples in the Museum at Ottawa is an example of a ventral valve which shows considerable difference in the form and the markings of the interior. It is a deeper shell, with more abrupt lateral slopes and is more triangular in outline at the front. It is a mould from which the shell has been mostly exfoliated. There is no trace of a deltidial groove or depression; the main muscle-scar of the crescent is undivided, and the anterior muscle-scar of this group distinctly visible is small: the sides of the pseudo-platform arch outward, the large, central muscles have left double scars, and the median septum is more decidedly shown than in the typical form. A distinct parietal band has a position similar to that in Lingula. The example studied is a quarter shorter than full grown examples of the typical form.

We cannot discover that there is any hollow platform in this species as there is in Trimerella, the central thickened part of the shell of the ventral valve corresponding to the platform in the ventral of that genus;

there is an incipient calcification and thickening of the edges and a median ridge.

Sculpture.—The surface ornamentation of longitudinal striæ is as described by Billings, but transverse growth lines also are present, and give the surface of the shell a cancellated appearance.

Size.—In the specimens sent from Newfoundland the length is as given by Mr. Billings, but the width is greater. Length of the ventral valve 27 mm., width 25 mm. The dorsal valve is about 3 mm. shorter. An example of the ventral valve in the museum at Ottawa has a length of 30 mm. and a width of 28. Depth approximately 3 mm.[1] These dimensions exceed those of any Lingulella known to me, but are such as would be looked for in shells of the Trimerellidæ.

Locality.—The gray white weathering sandstones of Great Bell Island, Conception Bay, Newfoundland.

The genus Trimerella to which this one is allied, is found in the Silurian (Upper) in Ontario, Sweden, etc.

SPHÆROBOLUS, n. gen. (provisional.)

This orbicular species is so different from the preceding (if Mr. Billings and the author have correctly interpreted the valves described as the ventral and dorsal valves respectively of this species) that it must be placed in a different genus. The unusual distinctness of the vascular trunks and their branches in the supposed ventral valve, the advaneed position of the central group of muscles in this valve, and the rarity of this valve in the material examined, also allow some doubt to remain as to whether this valve is a ventral. But it is evidently the valve which Mr. Billings regarded as the ventral of this species. Regarded in this light the genus finds its nearest relative in Dinobolus of Dr. Hall, which has valves of similar form; the resemblance to the Newfoundland species can be traced in the crescent and its scars and in the platform and its inequalities.

The thickened umbo of this form, especially in the dorsal valve, appears to have had spaces between the layers (now filled by a powdery siliceous deposit) that compare with the cavities in the umbones of Trimerella and other brachiopods; but we do not observe any vault or excavation beneath the thickened visceral part of the valves. The type of the genus is *Lingulella* (?) *spissa*, Bill.

SPHÆROBOLUS SPISSUS, Pl. I., Figs. 5*a–c*.

Lingulella ? spissa, Billings, Palæoz. Fossils, vol. ii., pt. i., p. 66, figs. 36*a* to *c*.

Mr. Billings's description of this species is as follows:

"Shell subpentagonal or subovate, length and width about equal, sometimes strongly ventricose. Dorsal valve with the front margin

[1] Measurements by Dr. Ami of the Geological Survey.

straight, or very gently convex, for about two-thirds of the width in the middle ; anterior angles rounded ; sides straight or slightly convex and subparallel until within two-thirds, or one-fourth the length from the back, then converging to the apex, where they form an obtuse angle which varies from 100 to 110 degrees. This valve is generally very convex, sometimes almost hemispherical ; the outline on a side view is rather abruptly elevated in the rostral third, depressed convex for a short space in the middle and then more gently descending to the front margin. Most of the specimens of this valve are eight or nine lines in length and about the same in width.

"The shell which is supposed to be the ventral valve of this species is gently convex, with usually a somewhat flattened space extending from the front margin upward toward the beak. The apical angle appears to be from 90 to 100 degrees. Shell very thick, of a lamellar structure, dark brown or nearly black, and sometimes when exfoliated, of an ashy gray colour. Surface with a number of obscure undulations of growth, and with fine longitudinal striæ about ten in the width of one line."

In the examples which the writer has seen the following features were observed :

The mould of the interior of the dorsal valve shows heavy muscle-scars. At each end of the hinge line is a small umbo-lateral scar ; from these scars a crescentic ridge extends forward on each side of the valve about two-thirds of its length, and terminates at a small scar ; within the bow of the crescent and about midway of its length is a large oval scar. The central scars as a group are in front of the midlength of the valve ; of these the lateral scars are equidistant from the beak and front of the valve ; the central scar is faintly double and is nearly three-quarters the length of the shell from the hinge ; behind it is an oval scar, elongated, and having a septum or thin plate on the median line of the valve.

Vascular trunks extend forward on each side of the valve, from the middle almost to the front margin ; from these trunks about half a dozen branches turn inward toward the visceral cavity, and more numerous branches outward toward the margin of the valve.

The ventral valve also has strong muscle-scars. There is no pedicle-groove, but a small rhombic ridge extending into the deltidial area may indicate a pedicle-pit ; behind this on each side are small scars (of the cardinal muscle ?)

The lateral muscles of this valve are more approximate than those of the dorsal, and the crescent is not so distinct ; the umbo-lateral scar is near the margin and is separated from the other two laterals which form a sigmoid curve and are in contact at their ends. In the central group of muscles the large paired scars are smaller, and in some examples closer together than those of the dorsal valve, and between them lies a median

ridge, divided lengthwise by a narrow septum, which extends from the middle of the valve half way to the front.

The imprint of the vascular trunks in this valve begin about one-third from the back and extend well forward on each side toward the front margin; there are about five branches turning inward toward the visceral cavity and numerous branches turned outward.

As indicated by Billings's name the valves of this shell are thick; they consist of four to six layers which are separated by a pulverulent substance; the spaces are perhaps cavities filled by infiltration subsequent to the entombment of the shells; the thickening of the shell is mostly posterior to the central muscles, though the margins of the pseudo-platform outside of these muscles are thickened.

The shell, by its massiveness and the arrangement of the muscle-scars, shows affinities with the Trimerellidæ, though we cannot refer it to any particular genus of that family. Its general form is that of Dinobolus and of the Dinoboli figured by Messrs. Hall and Clarke, it appears to be nearest to *D. Conradi*,[1] but it differs from all these by the oval form of the main scars of the central group, which are thus more like the central scars of Lingulella, so far as in that genus the dorsal valve is concerned.

The orbicular form, narrow mantle margins and heavy lateral muscles, give this shell a superficial resemblance to the Obolidæ, but the arrangement of the muscles, especially those of the ventral valve, is quite different.

Sculpture.—There is nothing to be added to Mr. Billings's description of the external features or surface markings of this shell.

Size.—Length of the dorsal valve 32 mm. Width 33 mm. The ventral valve is about 2 mm. longer than the dorsal.

Locality.—Great Bell Island in Conception Bay, Newfoundland, with the preceding.

This species is distinguished from the preceding by the advanced position of the muscle-scars and by having much narrower mantle margins, as well as by its general form.

The genus Dinobolus, to which this is allied, is found both in the Ordovician and Silurian systems. *Dinobolus Conradi* belongs to the Niagara group.

In endeavouring to determine the geological horizon of the sandstones in the islands of Conception Bay one is left in uncertainty by the few species found there and the small collections of fossils obtained from those islands. The fossils were formerly referred to the Potsdam sandstone, as they were thought to have a Primordeal aspect. But Cruziana and Eophyton, which occur there, are tracks or trails of animals, and the

[1] Op. cit. Pl. iv. B., figs. 13 to 24.

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species that made them are not known. The large forms of Eophyton (*E. Jukesi ?*), those having bands of long, straight or arched and parellel striæ, which the writer has referred to Ctenichnites, have been found at several horizons ranging from the lowest Cambrian to the Silurian (Upper) and so give but little help. The remains of animals actually found, Lingulidæ and Trimerellidæ, appear to have their best known analogues in the Silurian (Upper) and are at least as late as the Ordovician age.

ORTHIDÆ.

CLITAMBONITES, Pander.

CLITAMBONITES (GONAMBONITES) PLANA, Pander, var., Pl. II., Figs. 1*a* to 1*c*.

Gonambonites plana, Pander, Beitr. zur geogn. Russl. p. 78, pl. 16.
Orthis plana, deVerneuil, Russ. and Ural M't'ns, vol. ii., p. 199, pl. xi., fig. 7*a-h*.
Clitambonites plana, Hall and Clarke, Gen. Palæoz. Brachiop. pl. vii., fig. 28.

The following is de Verneuil's description of this species: "Shell semi-elliptical, depressed, with sharp edges, horizontal, not sinuous, and having its greatest width at the cardinal border. Ventral [dorsal] valve but little convex, provided with a very feebly marked sinus, and an area inclined almost 60° on the plane of the lateral edges. This area is two or three times less elevated than the area of the dorsal [ventral] valve, has in the middle a triangular slit, closed by a convex deltidium, which meets the deltidium of the opposite valve, and intercepts all apparent communication from the interior to the exterior. Under the deltidium in the form of a lip is found as in the preceding species [*Orthis inflexa*] a median tooth and two small lateral teeth. The dorsal [ventral] valve is flat and having depth only toward the area; this, high and a little recurved, is inclined like the area of the opposite valve, about 60° from the plane of the lateral edges; its surface is smooth and shows no vertical striæ. The triangular slit is narrow, and its angle at the summit from 30° to 40°. The surface of the two valves is covered with radiating striæ, fine, equal, several times dichotomous in their length, and not increasing in their size from the beak to the borders: at 10 millimetres from the beak one may count about 12 in the the space of 5 mm; they appear a little crenulated, and are interrupted by three or four transverse rings raised in steps.

"In the interior one observes under the beak of the dorsal [ventral] valve a kind of shield, the walls of which rise to the cardinal border, and abut against the two sides of triangular slit. This shield is terminated in front by a median point in the form of a beak, such as one ordinarily sees in many of the Cranias. The bottom of the valve is cut in straps, irregular and separated by a very prominent interior border from the edge, which is narrow and striated."

"VAR. RETROFLEXA," de Verneuil, Pl. II., figs. 1*a–c*.

Gonambonites retroflexa, Pander, Beitr. zur geogn. Russl., p. 77, pl. 25, figs. 1 & 2.

"This variety figured by Mr. Pander under the name of *Gonambonites retroflexa* is recognized by the extreme height of the dorsal [ventral] area, by the minuteness on the contrary of the ventral [dorsal] area, reduced to the degree that it is not more than the fifth of the first, by its cardinal angle more pointed, and finally by the length of the shell. The greatest width is not at the cardinal border, but beyond the middle of the shell, and the dorsal [ventral ?] valve is much more tumid than the ventral [dorsal ?]. All these differences are softened by insensible transitions. The same modification of the ventral area, which is so striking in this variety, is not there constant, and exists sometimes, on the contrary, in the type species. Without particular attention this variety might be taken for a distinct species."

The variety found at Cape Breton would agree with *retroflexa* rather than the type, but for the remark as to the relative tumidity of the valves; this excludes it unless there has been a transposition of the terms dorsal and ventral in this part of the description.

Certain features of the dorsal valve not described by de Verneuil are the following:

A mould of the dorsal valve shows that there was a median groove running from the umbo, nearly two-thirds of the length of the shell; and on each side of the groove appear three radiating vascular ridges (furrows of the interior surface ?). At the hinge line are the moulds of two short lateral plates, and at the centre of this line a group of three pits due to the cruræ and the cardinal process; this, the central pit, which is due to the cardinal process, is larger than the others.

Size.—Length of the ventral valve 16 mm. Width 20 mm.

Locality.—Gray sandstones of McFee's Point, near George River, Cape Breton, in company with *Lingulella Selwyni*, collected by Messrs. Weston and Robert.

HYOLITHES, Eichwald.

HYOLITHES *cf.* TENUISTRIATUS, Linrs., Pl. II., figs. 2*a* and *b*.

A large species of this genus occurs in company with *Lingulella Selwyni* in the gray sandstones of McFee's Point, which is nearly related to the above Swedish species. It also resembles the Bohemian *H. maximus*, Barr., and the American *H. princeps*, Bill., but appears to be a later species than any of these.

Apical angle about 12°. No grooves were observed within the margins on the dorsal side and no furrow at the median line on the ventral side. This side somewhat flattened on the sides but much more

convex than the dorsal ; on the average it is three times more convex, but the relative convexity is variable. The edge of the orifice of the shell on this side is slightly bowed upward in the middle, and near each end is a sinus where the growth line curves upwards before crossing over to the dorsal side, hence the rising arch of the edge on the dorsal side belongs partly to the ventral side.

The angles between the dorsal and ventral sides are sharp, especially in the apical half of the shell. The lip on the dorsal side is strongly arched upward, and the surface striæ correspondingly curved.

Sculpture.—On both sides are distinct transverse striæ, but no longitudinal striæ. The inner surface of the shell is smooth and does not show growth lines.

Size of the tube. Width at the aperture 14 mm. Shorter diameter at aperture 8 mm. Length of tube supposed to be about 50 mm. or more. The lip projects above the tube about 5 mm.

Locality.—Found with the preceding.

HOLASAPHUS, n. gen.

Among the fossils from McFee's Brook was a trilobite related to Asaphus, but different from any described genus. From Bathyurus, Bill., it is excluded by the shallowness of the furrows on the head-shield, and the low relief of the glabella ; it is shut out of Bathyurellus, Bill., by the narrow marginal fold and long axis of the pygidium ; from Protypus, Walc., by its shorter glabella, inclined to conical, and the prolonged angles of the free cheeks ; from Asaphiscus, Meek, by its Megalaspis-like pygidium ; from Asaphelina, Mun-Cham. and J. Berg., by having only one spine to the pygidium ; from Platypeltis, Call., by its shorter, cylindro-conical glabella, and markedly segmented and lobed pygidium.

Holasaphus centropyge, n. sp., Pl. II., figs. 4*a* and *b*.

Middle piece of the head sub-quadrate. Anterior margin with a distinct fold. Glabella sub-cylindrical, rounded in front, about one-quarter longer than wide, not furrowed. Occipital ring narrow, divided from the glabella by a narrow fold, and having an obscure tubercle at the back on the median line. Fixed cheeks slightly wider at the middle than half of the width of the glabella, widening before and behind the eyelobe, meeting in front of the glabella, furnished with short, prominent eyelobes, no ocular fillet. Posterior furrow and fold narrow, the former shallow.

Pygidium large sub-triangular, bordered all around, furnished behind with a sharp spine about one-third of its length. The axis is prominent and has three distinct rings and three obscure ones at the back of these ; each of the front rings is furnished with a small tubercle at the back edge. The side lobes of the pygidium have four costæ and sometimes a

fifth rib is obscurely shown; the furrows of the side lobes are straight and those toward the back are directed more and more backward.

Sculpture.—This consists of a fine granulation invisible to the naked eye.

Size.—Middle piece of the head—Length 10 mm. Width at the front 11 mm., at the back 15 mm. Pygidium length exclusive of the spine 9 mm., length of spine 3 mm., width 14 mm.

Locality.—McFee's Point near George River, Cape Breton.

The material on which the above description is based contains only the parts figured, and a large free cheek, which appears to belong to another species; it is similar to the cheek of an Angelina (Pl. II., fig. *b.*) The rock in which this fossil occurs is distorted by pressure and the figures are an average of several examples collected for the distortion.

Dr. Jules Bergeron has decribed a Megalaspis from the Lower Arenig beds of the south of France, whose pygidium is similar to that of our species, but of which the head is unknown; his pygidium, however, is more exactly that of a Megalaspis.[1]

Mr. Walcott has described a pygidium from the Pogonip group of Eureka, Col., *Bathyurus congeneris*, with a broken spine which is like ours, but it lacks the border-fold.[2]

Bathyurus caudatus, Bill., from the G-A beds of the Quebec group in Northern Newfoundland, based on a pygidium only, resembles our species in the number of segments in the pygidium and in possessing a terminal spine, but it has no furrow within the border.[3]

In the fragments of rock which contain the above species are a broken head-shield of a trilobite resembling a Homalonotus and the massive genal spine above referred to. This may have belonged to a species like *Bathyurellus formosus*, Bill.

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[1] Massif Ancien au sud du Plateau Central. p. 340, Pl. iv., figs. 3 and 4.

[2] Palæontolgy of Eureka District. Pl. viii., figs. 8 and 8*a*.

[3] Palæozoic Fossils. p. 261, fig. 245.

EXPLANATION OF PLATES.

Plate I.

Fig. 1.—*Lingulella Selwyni*, n. sp. Mag. $\frac{2}{1}$. *a.* Ventral valve, interior showing lateral muscle-scars, scars of anterior adductors, vascular trunks, etc. *b.* Dorsal valve, showing cardinal and lateral muscle-scars, central group of four scars, vascular trunks, etc. Both from McFee's Point. **See page 255.**

Fig 2.—*Lingulella Roberti*, n. sp. Mag. $\frac{2}{1}$. *a.* Ventral valve, showing deltidial area, vascular ridges, anterior adductor muscle-scars, vascular trunks, etc. *b.* Dorsal valve, showing cardinal muscle-scar, vascular ridges, median septum, central group of muscle-scars. Both from McFee's Point. **See page 256.**

Fig. 3.—*Lingula Howleyi*, n. sp. Nat. Size. *a.* Ventral valve, abraded example, showing the diverging ridges and print of the rhomb at different stages of growth. *b.* Dorsal valve, abraded example, showing pits of lateral muscles, etc. The large lozenge at the back of this figure shows the area over which the adductor muscles have moved during the growth of the shell, and the lanceolate area in front of the lozenge outlines, the front of the visceral cavity. From Kelly's Island, Conception Bay, Newfoundland. **See page 259.**

Fig. 4.—*Lingulobolus affinis*, Bill., sp. Mag. $1\frac{1}{2}$. *a.* Ventral valve mould of. *b.* Dorsal valve, mould of. **See page 261.**

The following features are noted (notation that of Messrs. Davidson and King for the Trimerellidæ) :

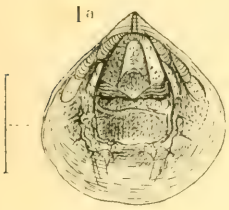
a. deltidium	*p.* post-median scars	*v.* central scars
g. lozenge	*q.* crown } crescent	*w.* sub-cardinal scars
l. median plate	*r.* side } crescent	*x.* umbo-lateral scars
m. median scars	*s.* end } crescent	*y.* parietal scars
n. anterior scars	*t.* transverse scars	*v.t.* vascular trunks
o. lateral scars	*u.* archlet	

c. Variety *cuneata*, n. var. Mag. $\frac{2}{1}$. Notation as above. *d.* Side view of same, showing crescent, scars of muscles and parietal band. All from Great Bell Island, Conception Bay, Newfoundland. **See page 262.**

Fig. 5.—*Sphærobolus spissus*, Bill., sp. Mag. $\frac{2}{1}$. *a.* Ventral valve, mould of; Notation as in preceding species. *b.* Dorsal valve, *e* cardinal callosities, notation otherwise as above. *c.* Section of the two valves to show the convexity. All from Great Bell Island. **See page 263.**

Plate II. (Part)

Fig. 1—*Clitambonites* (*Gonambonites*) *plana*, Pander, var. Mag. $\frac{2}{1}$. *a.* Ventral valve, mould of, showing deltidium, shield-like scar at the umbo, strap-like radiating grooves, and crenulated margin. *b.* Dorsal valve, mould of, showing low hinge area, wide deltidium, cardinal process, cruræ, crural plates, dorsal furrow, and vascular furrows. *c.* Section of the two valves, in profile. All from McFee's Point, Cape Breton. **See page 266.**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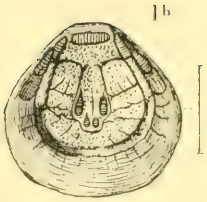
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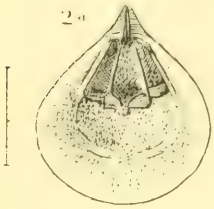
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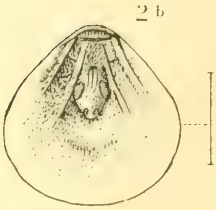
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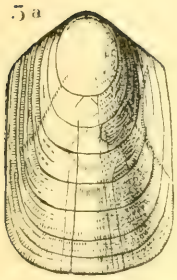
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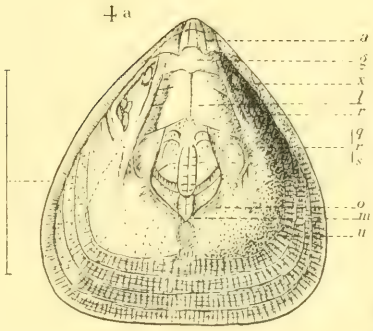
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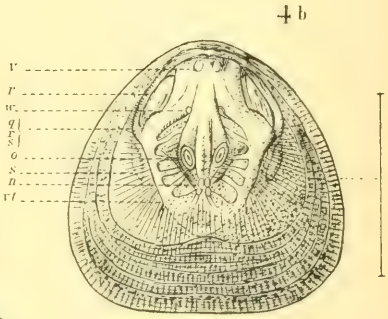
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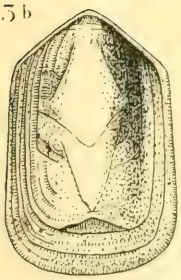
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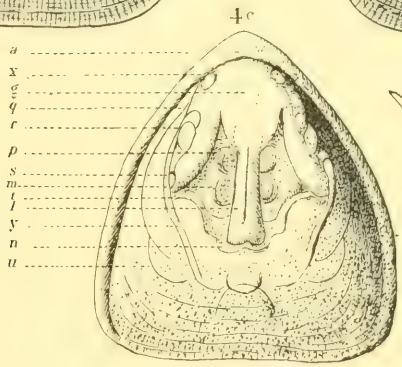
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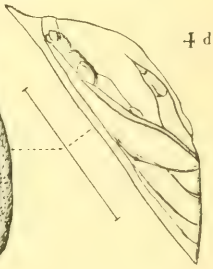
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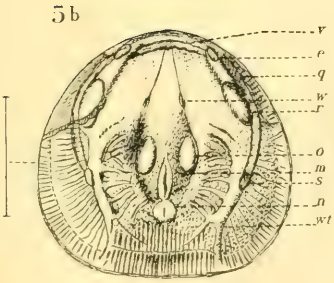
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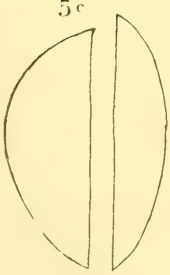
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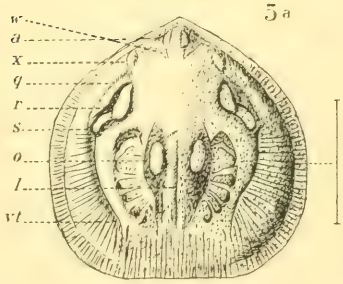
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Fig. 2.—*Hyolithes* c.f. *tenuistriatus*, Linrs. Nat. size. *a*. The conical shell, distal half showing the ventral side and lip of the dorsal side. *b*. The same, side view. From McFee's Point, George River, Cape Breton. **See page 267.**

Fig. 3.—Movable cheek of a trilobite. Nat. size. Same locality. **See page 269.**

Fig. 4.—*Holasaphus centropyge*, n. gen., et sp. Mag. $\frac{2}{1}$. *a*. Middle piece of the head-shield. *b*. Pygidium. N.B. The side lobes should have one furrow less. From McFee's Point, near George River, Cape Breton. **See page 268.**

Fig. 5.—*Lingulepis acuminata*, Conrad? Mag. $\frac{2}{1}$. *a*. Ventral valve, showing the position of the posterior adductor, the lateral and the central muscles. *b*. Dorsal valve, showing the posterior adductor and the lateral and one pair of the central muscles, as well as the course of the vascular trunks. Sandstone, Beverly, Ont. **See page 257.**

XIV.—*Organic Remains of the Little River Group, No. IV.*

By G. F. MATTHEW, D.Sc.

(Read May 16th, 1895.)

THYSANURA.

It is somewhat remarkable that among the many fossil insects that have been described, the Thysanura have few or no representatives. Since there is a considerable number of species extant in the modern world, one might reasonably expect that the study of the extinct faunas would give to science at least a few species of this order.[1] In fact, in a type so primitive as to have the three somites of the thorax separate from each other, we would naturally look for a larger proportionate representation among the insects of the ancient world. It is clear, however, that such a larger proportion has not yet been found. These considerations add special interest to a discovery in the plant beds at St. John, of the remains of an insect that appears to belong to this order.

PODURITES, n. gen.

PODURITES SALTATOR, n. sp., Pl. II., Fig. 10.

Body cylindro-fusiform. Head oblately oval, slightly extended behind, and showing traces of antennæ and eyes.

Thorax one-fifth longer than wide, of three separate segments, which are about twice as wide as long; the anterior angles of the first segment are rounded in toward the head and the posterior angles of the third segment has lobes projecting backward on each side of the abdomen.

The abdomen is fusiform, rapidly tapering in the posterior third, composed of about seven rings, and terminated by a spring (elater), the root of which appears to have been attached to the penultimate segment, and was fluted on the sides.

Size.—Length of the body, exclusive of the appendages, 20 mm.; width 3 mm. Length of the head 2 mm., of the thorax 4 mm., and of the abdomen 8 mm.

Horizon and *Locality.*—Plant Bed No. 2, Lower Cordaite Shales, Little River Group, St. John, N.B. Rare.

[1] A very peculiar acephalous insect found at Florissant has been referred to this order by Dr. Scudder, and an imperfect Lepisma was found at the same locality.

This little creature is clearly a hexapod and can best be referred to the Thysanura, as the three segments of the thorax are separate; there is a spring (elater) to the abdomen, and there are no traces of wings. It has not the compactness of body of the modern Springtail, but in its elongated form it approaches the species of Lepisma or Bristletails; however, these have more numerous segments to the abdomen than Podurites; and the strong stylet or spring of the latter is a distinguishing feature, that precludes us from placing it in Lepisma: the form and segmentation of the abdomen is thus intermediate between Podura and Lepisma, but sufficiently distinct from either to warrant the establishment of a new family for which I would suggest the name Poduritidæ.[1]

ARACHNIDA.

According to Dr. S. H. Scudder (1881) two hundred and fifty species of Arachnids have been described from the Tertiary deposits. Of these one hundred and ninety are true spiders, while the remainder are Acarina (mites), Ophiliones (11 species), Chernitidæ (9 species). Of these insects nine-tenths (1886) have been preserved in amber, leaving only a quarter of a hundred species from other sources as representatives of this great division of the ancient insect world when Dr. Scudder commenced his studies on the insect fauna of Florissant. This fauna is contained in lacustrine clays, and the result of Dr. Scudder's study of the insect remains contained in it—if we omit from consideration the Arachnids of the European amber—more than doubled the number of Arachnids known as fossils up to that time.

While this was the relative number of the European and American Tertiary spiders up to this time, important additions were also being made to our knowledge of the Palæozoic Arachnids, for in the succeeding decade spider-like animals began to be found in the coal measures and among them several peculiar types, differing from any known in the later ages. Among these were the Anthracomarti of Karsch, differing widely from modern spiders, and established as a separate order by that author.

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[1] Since the above paper was written another Thysanuran has been found, more remarkable than Podurites—that is, more difficult of comparison with any other modern form. While exhibiting the separate segments which are found in the thoraces of the Thysanurans, its head can only be compared with that of Scudder's genus Planocephalus, from the Oligocene beds of Florissant, or with certain suctorial Hemiptera. Perhaps it might be said that the existence of such a form as Planocephalus, best explains the peculiar structure of the new type, for it can be referred to the Thysanurans only on the same general considerations as have governed Dr. Scudder in so referring that genus.

The following summary of the fossil Arachnida is condensed from Dr. Scudder's review of these forms given in Bulletin 31 of the United States Geological Survey.[1]

Acari (Mites), Tertiary	36	species.
Chelonethi (Pseudoscorpions), Tertiary	9	"
Anthracomarti (extinct order), Carboniferous	16	"
Pedipalpi (Spider Scorpions), Carboniferous	2	"
Scorpiones (Scorpions), 3 Silurian, 8 Carboniferous, 1 Tertiary	12	"
Ophiliones (Spider Mites), Tertiary	13	"
Araneæ (Spiders)—2 Carbonif., 1 Jurass., 226 Tertiary	229	"

It is chiefly with the extinct order of Anthracomarti that we are at present interested, and this from the fact that Arachnids allied to this order have been found in the plant beds at St. John.

EURYMARTUS, n. gen.

EURYMARTUS LATUS, n. sp., Pl. II., Fig. 7.

Body oval, angulated in front at the sides. No distinction of width between the cephalothorax and the abdomen.

Cephalothorax bounded by a narrow raised border or rim. The cephalon has traces of organs in front which are probably antennæ; and centrally has a curved row of six (or eight) small scars, in a position where the eyes might be looked for. The cephalon is divided from the thorax by a narrow, low border.

The thoracic segment is sub-quadrilateral, more than three times as long as wide, sides slightly contracted at the back where it joins the first abdominal segment. The thorax is inclosed by a narrow raised rim, and has protective spines at the anterior and posterior corners on each side, the anterior spines directed outward and the posterior backward. On each side of the thorax is a row of about eight scars; these rows are inclined towards each other anteriorly, but are as far apart in front as the cephalothorax is long. At the front edge of the thorax in a line with the row of scars on each side, is a small elongated scar which may mark the point of attachment of a palpus; also at the back of the thorax, outside the posterior scars on each side of the thorax, is a small round scar, perhaps indicating a spiracle.

The abdomen of seven joints, is about as long as wide. It is divided longitudinally in three regions, a central one or rachis, inclosed by a sloping pleural region, and the whole bordered by a slightly raised, rather broad, marginal band. The first two rings of the abdomen are armed on each side with anterior and posterior spines, directed backward, the five posterior segments are arched more and more at the sides as they

[1] Systematic review of our present knowledge of fossil insects, U.S. Geol. Survey, Bulletin No. 31.

approach the posterior extremity; the last joint is broadly lenticular, obscurely outlined and contains the anus.

The suture at the back of the thorax and the sutures between the three first joints of the abdomen are of equal prominence, but those of the posterior segments of the abdomen become more and more obscure.

The imprints of two detached limbs of the thorax have apparently been preserved; the limbs as thus shown consist of six joints, which are about as long as the segments of the abdomen, except the fourth joint which is longer; the posterior joint is narrow and sharp-pointed. A detached anterior limb, which has been preserved, has a broad, probably lamellar termination.

Sculpture.—The whole body was granulated, the markings being just visible to the naked eye.

Size.—Length 10 mm. Width 7½ mm. Length of the limbs 5 mm.

Horizon and *Locality.*—Same as the preceding species. Rare.

This remarkable Arachnid is different from any known type, but it appears to come nearer the genus Anthracomartus than to any other forms of this sub-class, ancient or modern.

EURYMARTUS (?) SPINULOSUS, n. sp., Pl. II., Fig. 9.

A rather smaller species than the preceding. Only the abdomen is known.

The abdomen is ovate behind, and is marked by nine transverse rings. The three posterior and the anterior ring are obscurely defined (the latter owing to imperfect preservation). There is a marginal ridge near the sides and back of the abdomen; along the inner margin of this ridge at the sides there is a double row of spines (the row on the marginal ridge being directed inward and backward, and that at the ends of the segments being turned outward and backward). A pustule within the marginal ridge, at the posterior end of the abdomen, appears to mark the position of the anus.

Sculpture.—The surface is very finely pitted.

Size of the abdomen.—Length and width each 6 mm.

Horizon and *Locality.*—Same as the preceding. Rare.

This little species, by its broad marginal rim, straight anterior edge to the abdomen, and form of the segments, appears to belong to Eurymartus, but the absence of the cephalothorax makes the reference doubtful.

Though we have said that these Arachnids are allied to the Anthracomarti, it is only by a distant relationship. The most obvious distinction is the entirely different arrangement of the bases of the limbs, and the absence of wedge-shaped segments to the cephalothorax. The coxæ are arranged in two distant rows converging forward. It would appear then

that this type belongs to another order for which the name Eurymarti is proposed. The following are its distinctive features:

Order EURYMARTI.

Body depressed. Cephalothorax and abdomen of equal width, not clearly divided. Coxæ crowded in two rows distant from each other, converging forward. Abdomen forming a single mass of seven to nine segments sub-equal in width.

Family EURYMARTIDÆ.

Distinguished from Architarboidæ as follows:

Cephalothorax less than half of the length of the abdomen. Coxæ spreading from a broad trapezoidal space on the thorax. Abdomen oval, segments sub-equal in width.

From the genus Anthracomartus, its nearest ally, Eurymartus, is distinguished by its smaller but broad cephalothorax, obtusely triangular in front. Also by its oval abdomen nearly uniform in outline with the cephalothorax.

EURYMARTUS, sp. ? Pl. II., Fig. 8.

This very defective fossil is referred to the Arachnida on account of its resemblance to the abdomen of Eurymartus.

It consists of seven or more cemented segments. Of these the two anterior are separated by a stronger line of demarkation from the others, than the lines of division between these latter. The first segment is narrow (longitudinally) and is terminated at each end by a spine projecting backward; it has on the front edges a facet about half its length, apparently for the articulation of the cephalothorax. The remaining rings of the abdomen are apparently of about equal width. The second, third and fourth rings have lateral spines directed backward; those on the third ring are heavier than those on the rings in front. The rings behind the fourth do not show spines, but this may be due to the imperfect preservation of the fossil, as the posterior part of the abdomen is broken away. The sixth ring has a tubercle on the median line.

Sculpture.—The surface has a fine granulation, just visible to the naked eye.

Size.—Length of the part preserved 4 mm. Width 7 mm.

Horizon and *Locality.*—Dark shale of Plant Bed No. 8, Lower Cordaite Shales, Little River Group, St. John, N.B. Rare.

This peculiar fossil has some resemblance to the pleon of an Isopod, but differs in the following respects: The number of segments is in excess of those in that part of an Isopod, and they are narrower than such segments; they are also anchylosed, for the divisional lines are obscure.

From the known species of Eurymartus this fossil differs in the short facet at the front of the abdomen indicating a cephalothorax narrower than the abdomen, and in the absence of a marginal rim.

CRUSTACEA.

AMPHIPELTIS PARADOXUS, Salter, Pl. II., Fig. 6.

Quart. Jour. Geol. Soc., Feb., 1863.
Acad. Geol., 2nd Ed., p. 523.

The type of this crustacean, described some thirty years ago by Mr. J. W. Salter, is not now available to me ; I therefore describe herein the example preserved in the museum of the Natural History Society of New Brunswick, St. John, N.B.

This consists of five segments of the body. Of the anterior segment only a fragment is preserved ; the next three segments bear pleural spines directed backward, those on the two posterior of the three being larger ; in the last segment the spinal ridge is turned inward and apparently fused with the segment, forming part of a broad, lamellar terminal, plate, as in the typical example described by Mr. Salter.

Sculpture.—The several segments bear various markings ; the second has two small tubercles near the axial line, and the fourth and fifth have pleural grooves, somewhat distinctly impressed. The whole surface of the test is minutely pitted.

Size of this mutilated example. Length 15 mm. Width 12 mm.

Horizon and *Locality.*—From Plant Bed No. 2, Lower Cordaite Shales Little River Group, St. John, N.B.

Judging by the name given it, this was a perplexing fossil to Mr. Salter. Sir J. W. Dawson suggested that it might have been allied to the Stomapods,[1] a not unreasonable suggestion, considering the width of the front part, as shown by the type which Mr. Salter described. However, with the author's present view that all the animals of this plant bed, are either aerial, terrestrial or palustral forms, he is compelled to look elsewhere for relatives of this crustacean. Among terrestrial Crustaceæ the Isopods seem the group which would most likely have left remains such as this. If Amphipeltis be of this group, the rapidly varying segments would indicate that the example in the museum of the Natural History Society is a part of the pleon, probably the principal part ; and would indicate, so far as modern Isopods are concerned, an animal of very considerable size ; but still one not by any means so large as some fossil Isopods reported from the coal measures, and referred to the family

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Acadian Geology, 2nd Ed., p. 523.

Arthropleuridæ of Zittel.[1] These, however, were tuberculated forms, while Amphipeltis has a smooth test.

Among the marine Isopods *Cerolana concharum*, Harger, has a pleon similar to this fossil.[2]

EXPLANATION OF PLATE II. (PART).

Fig 6.—*Amphipeltis paradoxus*, Salt. Mag. $\frac{2}{1}$. Posterior part of the body, showing five segments, Plant Bed No. 2, Lower Cordaite Shales, Lancaster, N.B. **See page 278.**

Fig. 7.—*Eurymartus latus*, n. sp. Mag. $\frac{4}{1}$. Under side of the body with some of the limbs preserved. Same locality and horizon. **See page 275.**

Fig. 8.—*Eurymartus*, sp. ? Mag. $\frac{4}{1}$. Seven segments of the body. Plant Bed No. 8, Lower Cordaite Shale, Lancaster, N.B. **See page 277.**

Fig. 9.—*Eurymartus (?) spinulosus*. Mag. $\frac{4}{1}$. Nine segments of the abdomen. Plant Bed No. 2, Lower Cordaite Shale, Lancaster, N.B. **See page 276.**

Fig. 10.—*Podurites saltator*, n. sp. Mag. $\frac{2}{1}$. Head, thorax and abdomen. Same horizon and locality. **See page 273.**

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[1] Treatise on Palæontology, vol. ii., p. 662.

[2] U. S. Commission, Fish and Fisheries, Report, 1878 (1880). Pl. ix., fig. 55, and pl. x., fig. 59.

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